ENVIRONMENTAL ASSESSMENT

BIRD STRIKE RISK REDUCTION AT LAUGHLIN AIR FORCE BASE, TEXAS

United States Air Force
Air Education and Training Command
Laughlin Air Force Base

Report Documentation Page

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FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED BIRD STRIKE REDUCTION LAUGHLIN AIR FORCE BASE, TEXAS

Agency: Laughlin Air Force Base

Background: Under the National Environmental Policy Act, the Council on Environmental Quality regulations implementing the Act (Title 40 Code of Federal Regulations (CFR) 1500-1508); Department of Defense Directive 6050.1; Air Force Instruction 32-7061 which implements these regulations in the environmental impact analysis process (EIAP); and other applicable federal, state and local regulations; Laughlin Air Force Base conducted an environmental assessment (EA) for Bird Strike Risk Reduction.

Proposed Action: The proposed action is to supplement the current Wildlife Services (WS) program at Laughlin AFB to include target wildlife food base management to protect aircraft and human health and safety. In the proposed action, the implementation of insect management with Carbaryl (SEVIN) as a non-lethal bird and mammal damage management method would be the responsibility of Laughlin AFB.

Summary of Findings: The following paragraphs summarize the findings of the attached environmental assessment for the Proposed Action and No-Action Alternative.

Topography: No changes in the topography of the site are anticipated as the result of this action. No significant impacts were identified and no cumulative impacts are anticipated.

Wetlands: The closest wetland to the site is over 1,000 meters away. Site drainage is away from the wetland. For these reasons, no significant or cumulative impacts on wetlands are anticipated.

Floodplains: This project will have no impacts on floodplains. The nearest floodplain is over 1,000 meters away and the site does not drain onto the floodplain. No significant impacts on floodplains are foreseen.

Surface Waters: Surface waters will be unaffected by this project. The closest body of water is 2,000 meters away. Storm sewers drain the area. Discharge from the storm sewers is regulated by a National Pollutant Discharge Elimination System permit. There will be no significant impacts on surface waters resulting from this project.

Historic Preservation: There will be no impact on historic buildings or structures and no impact on historic preservation.

Transportation: No impacts are expected on transportation. No significant permanent increases in employment are anticipated as the result of this project.

Utilities: Impacts on utilities will be insignificant.

Socioeconomic: No significant negative impacts are expected in the socioeconomic areas. No cumulative negative impacts are expected.

Noise: No change in noise levels off-base are forecasted as a result of this action. No additional flying or noise is expected. There will be no cumulative effects due to noise.

Soils: No significant impacts are expected on soils. The soils in the area are suitable for wildlife and grazing but not agriculture.

Biological Resources: Vegetation on the unpaved portion of the site is sparse. The Laughlin Biological Survey found no threatened or endangered plants or animals in the project area. No significant impacts on biological resources are anticipated. No cumulative impacts on biological resources are expected as a result of this action.

Archeological Resources: Laughlin's archeological resources were identified by surveys conducted under the direction of the National Park Service. None of these resources are in the project area. Therefore, no significant impacts on archeological resources are anticipated.

Environmental Justice: The extent of this action will be limited to the boundaries of Laughlin AFB and will have no major social or economic impacts on any low income and or minority groups. The project will therefore be in compliance with EO 12898.

Air Quality: Laughlin is in an attainment area for all National Ambient Air Quality Standards. The cumulative impact to air quality, from application of Carbaryl SEVIN as specified by Manufacturer Label Instructions and associated Material Safety Data Sheets, is very limited since the volatile emissions of this product are limited to near ground application.

Hazardous Material and Hazardous Waste: Laughlin will track all quantities of the material used and be responsible for proper waste disposal resulting from the use of the material. The base has an Integrated Pest Management Plan and a Hazardous Waste Management Plan that specifically detail responsibilities and procedures used to comply with governing regulatory standards.

Industrial Hygiene: The application of pesticides on the airfield will be accomplished by trained and certified contract personnel in a manner that is consistent with governing standards. Therefore, this criterion is deleted from further consideration.

Land Use: Land use both on and off base is not expected to change. No significant or cumulative impacts on land use are expected to result from this action.

Other Alternatives: The Air Force considered several alternatives. These included; various non-chemical bird harassment techniques, alternative pesticide formulations and a no action alternative. Bird harassment has been implemented to the maximum extent practical and will be utilized on a recurring basis whenever possible. Alternative pesticide formulations were evaluated but found to be either less effective or less safe than optimal for the proposed action.

Evaluation of the No-Action Alternative: The no-action alternative represents an unacceptable level of continued risk to mission operations. The combination of all other bird strike reduction techniques do not adequately attain an equivalent or superior level of benefit as expected to be realized by the proposed action.

Finding of no Significant Impact

Based on my review of the facts and analysis contained in the environmental assessment, which is incorporated herein, I conclude the proposed action has no significant impacts either by itself or considering cumulative impacts. Accordingly, the requirements of the National Environmental Policy Act regulations promulgated by the President's Council on Environmental Quality, and Air Force Instruction 32-7061 are fulfilled, and an environmental impact statement is not required.

Laro Clark

DAN LARO CLARK , Colonel, USAF
Vice Commander, 47th Flying Training Wing

25 JAN 08

Date

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ACRONYMS

AGL	Above Ground Level
AOA	Airport Operation Area
APHIS	Animal and Plant Health Inspection Service
BASH	Bird Aircraft Strike Hazard
BO	Biological Opinion
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DP	Depredation Permit
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
FAR	Federal Aviation Regulations
FEIS	Final Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
ICAO	International Civil Aviation Organization
IWDM	Integrated Wildlife Damage Management
LAFB	Laughlin Air Force Base
MBTA	Migratory Bird Treaty Act
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOA	Notice of Availability
PPQ	Plant Protection and Quarantine
SOP	Standard Operating Procedure
T&E	Threatened and Endangered
USAF	United States Air Force
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WS	Wildlife Services

CHAPTER 1: PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION AND BACKGROUND

Aircraft/wildlife strikes[1] are the second leading causes of aviation-related fatalities. Globally, these strikes have killed more than 400 people and destroyed more than 420 aircraft. While these events are rare when compared to the millions of aircraft operations, the potential for catastrophic loss of human life and property resulting from one incident is substantial. Depending on the force of the impact, the strike may damage or even destroy components of the aircraft, or injure or kill people in the aircraft. High speed modern jet engine aircraft produce enormous amounts of energy and speed, and a wildlife strike may cause substantial damage[2] or even a total catastrophic failure to the aircraft[3]. Flocks of birds are especially dangerous when in an airport proper, and can lead to multiple strikes and damage within seconds. Depending on the damage, aircraft at low altitudes or during take off and landing often cannot recover in time and crash.

The risk that wildlife poses to aircraft is well documented with Orville Wright first reporting a bird strike in 1905. The first recorded bird strike fatality was reported on April 3, 1912, at Long Beach, California when aero-pioneer Cal Rodgers collided with a gull (*Larus* spp.). The impact broke a guy wire which jammed the aircraft controls of his model EX Wright Pusher airplane. He crashed, was pinned under the wreckage and drowned.

The greatest loss of life directly linked to a bird strike was on October 4, 1960, when Eastern Air Lines Flight 375, a Lockheed L-188 Electra, flying from Boston, flew through a flock of starlings (*Sturnus vulgaris*) during take off, damaging all four engines. The plane crashed shortly after take-off into Boston harbor, killing 62 people. Subsequently, minimum bird ingestion standards for jet engines were developed (Cleary and Dolbeer 1999). More recently, 24 lives were lost when an E-3B "AWACS" aircraft struck a flock of Canada geese at Elmendorf, Alaska in 1995. Further, the Space Shuttle Discovery also hit a bird during take-off on July 26, 2005, however at lower speeds with no obvious damage to the shuttle occurred. National Aeronautics and Space Administration (NASA), however, lost an astronaut, Theodore Freeman, to a bird strike; he was killed when a goose shattered the plexi-glass cockpit of his T-38 trainer, resulting in shards being ingested by the engines leading to a fatal crash.

The following recent aviation accidents caused by bird strikes further demonstrates the serious impacts that birds can have on aviation safety (USDA-FAA 2002):

<u>Burke Lakefront – Ohio</u>
May 8, 2002-A Beechjet 400 aborted take-off after striking a flock of ring-billed (*Larus delawarensis*) and herring gulls (*L. argentatus*) on take-off. Both engines ingested gulls and were damaged. One engine had an uncontained failure. The aircraft was towed back to the hangar and 14 gull carcasses were recovered. Estimated cost was $600,000.
<u>Dallas-Fort Worth – Texas</u>
February 24, 2002-An FK-1000 struck a flock of white-fronted geese (*Anser albifrons*), ingesting one goose shortly after take-off. The pilot made a precautionary landing. The engine, nose, and wing of the aircraft were damaged. One engine was replaced. The cost of repairs and lost revenues totaled $654,000. The aircraft was out of service for 8 days.
<u>Denver International – Colorado</u>
January 26, 2002-A Boeing 757 struck a great horned owl (*Bubo virginianus*) during take-off, requiring a precautionary landing after the pilot reported engine vibration. Several fan blades on the engine were damaged and feathers were found in the engine. Damage and costs were estimated at $500,000. The aircraft was out of operation for 3 days.
<u>Detroit Metropolitan – Michigan</u>
December 6, 2001-A Boeing 737 struck a flock of gulls and ingested one shortly after take-off. The engine flamed

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[1] The collision of an animal with aircraft is commonly referred to as a "strike." The definition of a wildlife strike was developed by the Bird Strike Committee Canada and has been endorsed by the International Civil Aviation Organization (ICAO), Bird Strike Committee USA, Bird Strike Committee Europe, the FAA, the USAF, and most airports throughout the United States (Transport Canada 1992).

[2] "Substantial damage occurs when the aircraft incurs damage or structural failure which adversely affects the structural strength, performance or flight characteristics of the aircraft and which would normally require major repair or replacement of the affected component" (ICAO).

[3] The impact of a 12 pound bird at 150 mph equals a 1000 pound weight dropped from a height of 10 feet.

out, forcing an emergency landing. The engine was replaced. Costs were estimated at $2.3 million.
Memphis International – Tennessee
November 20, 2001-A Boeing 727 struck a flock of snow geese (*Chen caerulescens*) on approach. At least three geese impacted the aircraft, one shattering the cockpit windshield and two penetrating the right wing near the leading edge slats. Cost of repairs and lost revenue was $700,000. The aircraft was out of service for 7 days.
Lakefront – Louisiana
November 3, 2001-A Cessna Citation II struck a flock of ducks shortly after take-off. The pilot made a precautionary landing. The engine inlet and inlet fan were damaged and the right wing was damaged. Cost of repairs totaled $605,000 and the aircraft was out of service for 30 days.
John F. Kennedy Airport – New York
June 3, 1995-A Concorde ingested a Canada goose (*Branta canadensis*) on touchdown into the #3 engine, which had an uncontained failure causing parts to go into the #4 engine. Both engines were destroyed. Flames and smoke were seen coming from both engines. Cost was more than $9 million and the aircraft was out of service for 5 days. The New York Port Authority paid $5.3 million in compensation for losses.

Approximately 90% of aircraft-wildlife strikes occur on or near airports, when aircraft are below altitudes of 2,000 feet[4]. Aircraft/wildlife strikes at these elevations are especially dangerous because aircraft are moving at high speeds and are close to or on the ground. Aircrews are focused on complex take-off or landing procedures and monitoring the movements of other aircraft in the airport vicinity. Aircrew attention to these activities while at low altitudes often compromises their ability to successfully recover from unexpected wildlife collisions and to deal with rapidly changing flight procedures. As a result, crews have minimal time and space to recover from aircraft/wildlife strikes putting crews and aircraft in jeopardy. However, bird strikes have also been reported at high altitudes, some as high as 18,000 to 27,000 feet above ground level (AGL).

Increasing bird and mammal populations in urban and suburban areas near airports contribute to escalating aircraft-wildlife strike rates. Federal Aviation Administration (FAA), United Sates Air Force (USAF), and U.S. Department of Agriculture (USDA)-Animal and Plant Health Inspection Service (APHIS)-Wildlife Services (WS) experts expect the risks, frequencies, and potential severities of aircraft/wildlife strikes to increase during the next decade as the numbers of aircraft operations increase to meet expanding transportation and military demands (Cleary et al. 2000).

1.2 PURPOSE

The purpose of this EA is to analyze the effects of wildlife food base (*i.e.*, insect) management at Laughlin Air Force Base (LAFB) to reduce human/wildlife conflicts, hazards and damage to aircraft (Figure 1-1 and 1-2) caused by birds and mammals. The magnitude of wildlife hazards to aviation will likely increase with the rise in air traffic volume and target wildlife populations. The adaptability of many wildlife species to human activities and the dramatic increase in the population of some highly adaptable species compounds this problem. Experts within the FAA and USDA expect the risk, frequency, and potential severity of wildlife/aircraft collisions to escalate over the next decade (Cleary et al. 2002). The goal of this project at LAFB is to facilitate better protection of aircraft and human health and safety by further discouraging birds and mammals (Table 1-1) from utilizing critical air and ground space necessary for safe aircraft operations.

Figure 1-1. Fan Blades Damaged as a Result of a Bird Strike.

1.3 NEED FOR ACTION

Birds and mammals frequent airports and their environments because these areas contain natural and man-made habitats that provide food, water, shelter and open spaces. This can bring wildlife that frequent airports into conflict

4 According to the FAA wildlife hazard management manual for 2005, less than 8% of strikes occur above 900 meters and 61% occur at less than 30 m (100 feet).

with aviation and human health and safety[5].

Figure 1-2. A Helicopter Windshield after a Bird Strike.

The FAA and the USAF maintain a database which contains information on more than 54,000 reported United States civilian and military aircraft-wildlife strikes between 1990 and 1999. During that decade, the FAA received reports indicating that aircraft/wildlife strikes, damaged 4,500 civilian U.S. aircraft (1,500 substantially), destroyed 19 aircraft, injured 91 people, and killed 6 people. Additionally, there were 216 incidents where birds struck two or more engines on civilian aircraft, with damage occurring to 26% of the 449 engines involved in these incidents. The FAA estimates that during the same decade, aircraft sustained $4 billion worth of damages and associated losses and 4.7 million hours of aircraft downtime due to aircraft-wildlife strikes. For the same period, FAA estimates that the 28,150 aircraft-wildlife strike reports it received represent less than 20% of the actual number of strikes that occurred during the decade. USAF planes colliding with wildlife resulted in 10 Class A Mishaps, 26 airmen deaths, and over $217 million in damages. The combined military services report an average of 2,600 bird strikes annually (Cleary and Dolbeer 1999).

Obviously, collisions between aircraft and wildlife are a concern in the U.S., at LAFB and throughout the world because they threaten crew and passenger safety (Thorpe 1997), result in lost revenue and costly repairs to or loss of aircraft (Milsom and Horton 1990, Linnell et al. 1996, Robinson 1997), and erode public confidence (Conover et al. 1995). While wildlife/aircraft strikes that result in human fatalities are rare[6], the consequences can be catastrophic.

A high percentage of bird strikes occur during peak migration periods, but dangerous situations can develop anytime. Aircraft are most vulnerable to bird strikes when at low altitudes, generally related to landing and taking off. Approximately 55% of strikes occur below 600 feet AGL which is why management of the area immediately surrounding taxiways, runways, and runway approaches is vital (Cleary et al. 1998).

During the early days of aviation, when aircraft flew at slower speeds, wildlife had little difficulty getting out of the aircraft's way. Wildlife strikes were infrequent, and when they did occur, damage was usually minimal. However, with the introduction of jet aircraft, bird strikes became a serious threat and a much more costly problem. The rapid acceleration and increased speeds of jet turbine and modern propeller-driven aircraft give birds and other animals far less time to react to approaching aircraft. Longer runways and more complete use of runways by jet aircraft also increase the likelihood of strikes. The energy released as a result of a high-speed aircraft/wildlife collision is tremendous, especially to technologically advanced turbine engines that use lightweight, high speed mechanical parts (Blokpoel 1976).

The USAF and WS have identified strike hazards associated with birds and mammals at LAFB (Figures 1-3 and 1-4). Bird activity and strikes exhibit seasonal peaks associated with spring and fall migration at LAFB. The LAFB aircraft operations area (AOA) is approximately 700 acres of open grass fields, concrete runways and taxiways. The open grass areas of LAFB are managed to reduce potential wildlife strikes, but these same areas do provide feeding areas for insectivorous wildlife. WS has recommended spraying insects (*i.e.,* the wildlife's food base) in the spring and fall to reduce wildlife attractants and thus lower the risk of a wildlife/aircraft strike.

1.3.1 Need for Wildlife Damage Management to Protect Property and Human Health and Safety

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5 A bird or mammal strike is deemed to have occurred when:

- A pilot reports a strike.
- Aircraft maintenance personnel identify damage as having been caused by a bird or mammal strike.
- Personnel on the ground report seeing an aircraft strike one or more birds or mammals.
- Bird or mammal remains, in whole or in part, are found on a runway pavement area or within 60 m (200 ft.) of a runway, unless reason for the bird's or mammal's death is identified otherwise.

6 It is more common for wildlife/aircraft strikes to result in expensive repairs, flight delays, or aborted aircraft movements.

An overview of wildlife hazards to aviation is discussed in Section 1.1 and Section 1.3. Wildlife poses risks to human health and safety when their populations reach relatively high numbers or when concentrated in a localized area. These risks include but are not limited to things such as disease transmission and injury or death to persons involved in wildlife/aircraft strikes. Direct wildlife strikes are the most common hazard to aircraft operations and damage caused by them includes: penetration of windscreens by birds, damage to fuselage or landing gear on impact, and ingestion of bird(s) or mammal(s) into the engine(s).

In addition to damage caused by direct strikes, other types of wildlife activity can compromise airport safety or damage equipment, causing an indirect hazard to aviation safety. Examples include: fires in aircraft or structures caused by nesting or bedding material, communication interference from birds perching on antennae, damage to ground based safety equipment and/or short circuiting electrical systems by chewing, urination, fecal deposits or nesting material, crumbling or cracking of paved surfaces caused by burrowing animals, radar interference from passing flocks of migrating birds, interference of signals from navigational aids, and providing an attractant such as small mammals for raptors or predatory animals.

Table 1-1. Species Posing a Risk to Aviation Safety at LAFB[1].

Common Name	Scientific Name
Birds	
Cliff Swallow	*Hirundo rustica*
Barn Swallow	*Iridoprocne bicolor*
Black Vulture	*Coragyps atratus*
Brown-headed Cowbird	*Molothrus ater*
Crested Caracara	*Caracara plancus*
Western Kingbird	*Tyrannus verticalis*
European Starling	*Sturnus vulgaris*
Gulls	*Larus spp.*
Horned Lark	*Eremophila alpestris*
House Sparrow	*Passer domesticus*
Killdeer	*Charadrius vociferus*
Least Sandpiper	*Calidris minutilla*
Solitary Sandpiper	*Tringa solitaria*
Rock Dove (Feral Pigeon)	*Columba livia*
Mourning Dove	*Zenaida macroura*
Eastern Meadowlark	*Sturnella magna*
Western Meadowlark	*Sturnella neglecta*
Scissor-tailed flycatcher	*Tyrannus forficatus*
Common Nighthawk	*Chordeiles minor*
Common Grackle	*Quiscalus quiscula*
Great-tailed Grackle	*Quiscalus mexicanus*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Swainson's Hawk	*Buteo swainsoni*
Turkey Vulture	*Cathartes aura*
White-winged Dove	*Zenaida asiatica*
Mammals[2]	
Bats	
Armadillo	*Dasypus novemsinctous*
Striped skunks	*Mephitis mephitis*

[1] This list compiles the most common species found at LAFB, however any wildlife species found on the airport proper could cause a hazard and actions could be taken to reduce the hazard.
[2] While minor in both risk and numerical strikes, mammals may also have management actions conducted to reduced aircraft strikes.

1.3.1.1 Need for Bird Damage Management to Protect Property and Human Health and Safety

Birds are a continuous threat to aircraft for the simple fact that they are highly mobile and often prefer the habitat created by an airfield. Bird/aircraft strikes occur when birds occupy the same space as aircraft. The risk of injury is great in these incidents and the loss of life has happened many times (Cleary et al. 2002). At LAFB, these threats come in many shapes and sizes. Black vultures (*Coragyps atratus*) and turkey vultures (*Cathartes aura*) pose the greatest risk due to their large size and soaring behavior. Insectivorous birds pose significant threats as they migrate through the area. Due to the open grassland in the AOA many bird species are attracted to the airfield (Section 1.2). Additionally, other species of birds, which may be seasonally in and around LAFB, posing not only a risk of a strike but a health hazard associated with the roost. Grackles and European starlings regularly migrate and roost in large flocks which may locate near the airfield during migration. In addition to the threats to aircraft safety feral domestic pigeon (*i.e.*, rock dove) roosts may pose a significant health threat. The problems associated with these roosts create disease risks, plus the mess associated with droppings left by concentrations of birds is aesthetically displeasing and results in continual clean-up costs.

In addition to the threats that birds pose through direct strike risk, they are responsible for indirect property damage as well. At least three well-documented aviation accidents in the United States have been attributed to birds nesting on or in aircraft. In one case, a nest was built in the engine air inlet of a single-engine, general aviation aircraft. On takeoff, the nest was sucked into the carburetor, and the aircraft lost power and crashed. In another case, an open fuel cell panel was selected as a nesting site by a house sparrow. The nesting material was inadvertently enclosed inside the wing by a mechanic. After several flights, fuel flow was disrupted by the nesting material, causing the aircraft to lose power and crash. The third incident involved an engine compartment fire. The fire occurred after bird nesting material was ignited by engine heat. The aircraft made a forced landing and was damaged on touchdown.

Birds occasionally also damage structures with feces. Accumulated bird feces can reduce the functional life of some building roofs by 50% (Weber 1979). Corrosive damage to metal structures and painted finishes, including those on aircraft and automobiles parked at terminals, can occur because of uric acid from bird feces. Pigeons, starlings and house sparrows sometimes cause structural damage to the inside of hangers and buildings. These birds often roost or nest in the rafters of the buildings where they damage the insulation, and wiring.

Figure 1-3. LAFB Bird Strikes from FY99 through FY06

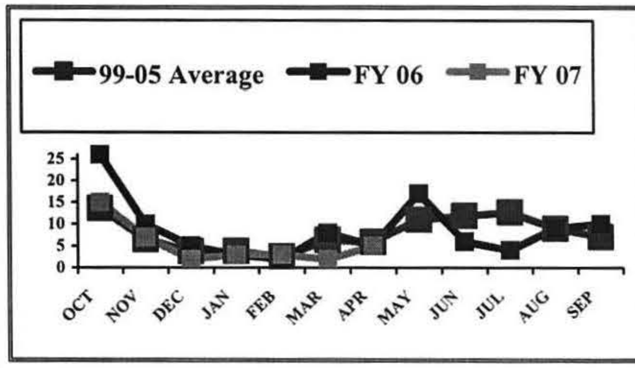
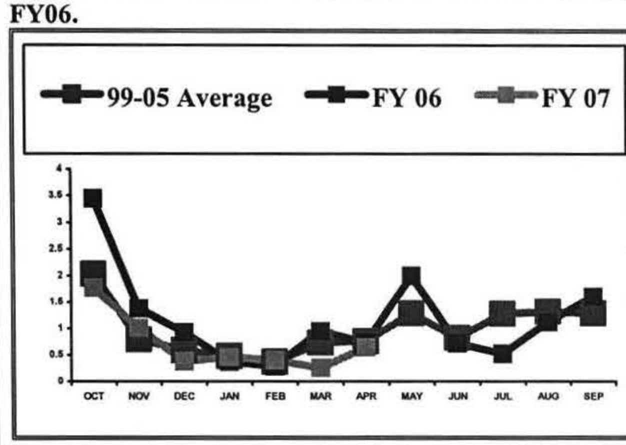


Figure 1-4. LAFB Bird Strike Rate from FY99 through FY06.



1.3.1.2 Need for Mammal Damage Management to Protect Property and Human Health and Safety

Mammals also pose a serious threat to aircraft. Deer (*Odocoileinae*), coyotes (*Canis latrans*), fox (*Vulpes vulpes*), raccoons (*Procyon lotor*), armadillos, bats and skunks venture onto airfields and become a direct threat to planes landing and taking off. Between 1990 and 2001, 983 mammal strikes by aircraft were reported to the FAA (Cleary et al. 2002). Not surprisingly, a much higher percentage of mammal strikes (65%) resulted in aircraft damage than did bird strikes (16%). Since 1985, the USAF has recorded more that 190 strikes that involved aircraft and mammals (Cleary and Dolbeer 1999). These strikes resulted in more than $496,000 in damage. Of these strikes, deer are the most costly to aircraft.

1.4 SUMMARY OF CURRENT AND PROPOSED ACTION

WS is often contacted and asked to solve problems involving wildlife damage issues in relation to human safety. At LAFB there is the continuing risk of a wildlife/aircraft strike which could result in human injury or death of the aircrew, passengers or personnel on the ground (Cleary and Dolbeer 1999). WS has also been asked to resolve such problems as the removal of wildlife from under buildings, in common areas where people work or congregate, and from the airfield. WS projects the need for BASH activities to remain or increase as bird and mammal populations increase throughout the US. Many of the species identified as a significant risk in Table 1-1 are locally or nationally abundant. To further protect aircraft and human health and safety, it is important to analyze all legally available methods to reduce risks. The projected management of insect populations and resultant bird and mammal food source as a non-lethal bird damage management activity may be necessary to reducing the risk of a wildlife strike to an acceptable level.

1.4.1 Current Action

A variety of wildlife/human conflict reduction services have been and are currently being provided by WS to reduce hazards at LAFB. These services include technical assistance, wildlife hazard assessments, wildlife hazard management plans, and operational assistance. Operational assistance currently involves one full-time WS Wildlife Biologist to assist with wildlife hazard management activities. LAFB personnel are also assigned to BASH duties. An Integrated Wildlife Damage Management[7] (IWDM) approach has been implemented, allowing the use of legally available techniques, used singly or in combination, to meet the need to reduce conflicts with wildlife affecting the use of the airfield and safe airport operations (Appendix B). Lethal methods currently used by WS include shooting and trapping. Non-lethal methods currently used by WS or implemented directly by LAFB include localized habitat alteration, repellents, fences/barriers and deterrents, capture and relocation, and harassment or scaring devices.

1.4.2 Proposed Action

The proposed action is to supplement the current WS program at LAFB to include target wildlife (Table 1-1) food base management to protect aircraft and human health and safety. In the proposed action, the implementation of insect management with carbaryl as a non-lethal bird and mammal damage management method would be the responsibility of LAFB.

1.5 RELATIONSHIP OF THIS ENVIRONMENTAL ASSESSMENT TO OTHER ENVIRONMENTAL DOCUMENTS

- WS has issued a Final Environmental Impact Statement (FEIS) on the national APHIS/WS program (USDA 1997) which analyzed use of WS' damage management methods and program activities. Pertinent information available in WS' FEIS has been incorporated by reference into this EA.
- APHIS Plant Protection and Quarantine (PPQ) has issued a FEIS on grasshopper management which identified alternatives and analyzed ecological consequences of several terrestrial insect management alternatives. Pertinent information available in PPQ's FEIS has been incorporated by reference into this EA.
- WS operational and technical assistance activities at LAFB have been conducted under a WS categorical exclusion (CE).
- WS lethal human/wildlife conflict management activities for Migratory Bird Treaty Act (MBTA) protected birds are conducted under permit from the USFWS. The USFWS is responsible for NEPA on the permit process, including the ecological consequences of not only the direct take at LAFB, but the cumulative consequences on bird species within the flyway.

1.6 OBJECTIVES OF THE PROPOSAL AND DECISION TO BE MADE

1.6.1 Objective for the Bird Aircraft Strike Hazard (BASH) Program at LAFB

The objective of the proposed action and of the BASH program is to minimize the threat to human health and safety and damage to aircraft at LAFB.

1.6.2 Decision to be Made

Based on the scope of this EA, the decisions to be made are:

- Should insect population management be implemented as a non-lethal human/bird and mammal conflict reduction strategy at LAFB?
- If not, should LAFB attempt to implement any of the alternatives to an IWDM strategy as described in the EA?

[7] All management actions will comply with appropriate federal, state, and local laws, regulations, orders and policies.

- Might the implementation of a non-lethal human/wildlife conflict reduction program have significant impacts requiring preparation of an EIS?

1.7 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT ANALYSIS

1.7.1 Actions Analyzed.

This EA evaluates insect management by LAFB as a non-lethal human/wildlife conflict reduction tool to protect aircraft and human health and safety.

1.7.2 Period for Which this EA is Valid.

This EA will remain valid until it is determined that new needs for action or new alternatives having different environmental effects must be analyzed. At that time, this analysis and document will be reviewed and revised as necessary. This EA will be reviewed each year to ensure that it is complete and still appropriate to the scope of human/wildlife conflict reduction activities at LAFB.

1.7.3 Site Specificity.

This EA analyzes potential impacts of human/wildlife conflict reduction activities that could occur at LAFB. Over time, the numbers and species of wildlife may change. The amount of land treated during the proposed action may also change, depending on the alternative selected and designated AOA. However, this EA analyzes the environmental consequences of a number of alternatives, including a no-action alternative and chemical treatment alternative and thus fulfills the site specific requirements of NEPA.

1.7.4 American Indian Lands and Tribes.

Currently, there are no issues identified with any American Indian tribes. If any tribal issues are identified in the future this EA would be reviewed and supplemented, if appropriate, to insure compliance with NEPA. MOUs, agreements and NEPA documentation would be prepared as appropriate before conducting activities on tribal lands.

1.7.5 Summary of Public Involvement.

Issues related to the proposed action were initially developed by WS following meeting with LAFB. Issues were defined and preliminary alternatives were identified. As part of this process, and as required by the Council on Environmental Quality (CEQ) and USAF-NEPA implementing regulations, this document and its Decision are being made available to the public through "Notices of Availability" (NOA) to allow interested parties the opportunity to obtain and review the document and comment on the proposed human/wildlife conflict reduction program. New issues or alternatives raised after publication of public notices will be fully considered to determine whether the EA and its Decision should be revisited and, if appropriate, revised.

1.8 AUTHORITY AND COMPLIANCE TO REDUCE WILDLIFE DAMAGE/CONFLICTS

1.8.1 Laughlin Air Force Base[8]

[8] Because of WS' special expertise, LAFB has contracted with WS to prepare an EA to evaluate environmental risks from the proposed program. This EA evaluates the need to reduce human/wildlife conflicts on LAFB and the feasible and practical ways by which wildlife/aircraft strikes can be reduced at LAFB. Because the existing WS work is conducted under a WS CE and USFWS permit, this EA will focus on the reduction of wildlife food attractants as a non-lethal method of reducing wildlife/aircraft strike risks. The decision whether to implement or not to implement an alternative or a combination of the alternatives will rest with LAFB personnel.
WS and LAFB are preparing this EA to assist in reduction of human/wildlife conflicts, including reducing human health and safety risks, and to clearly communicate with the public the analysis of cumulative impacts for a number of issues of concern in relation to alternative means of meeting needs for such management.
This EA documents the analysis of the potential environmental effects of the proposed program. This analysis relies mainly on existing data contained in published documents, including the Animal Damage Control Final Environmental Impact Statement (USDA 1997). All activities will be undertaken in compliance with relevant laws, regulations, policies, orders, and procedures including the Endangered Species Act (ESA). While preparation of the EA is conducted under agreement with LAFB, USAF implementing regulations will apply to any decision reached from

The mission of the USAF is to defend the United States and its global interests -- to fly and fight in air, space, and cyberspace. To achieve that mission, the USAF has a duty of global vigilance, reach and power. That vision focuses around three core competencies: 1) developing airmen, 2) technology-to-warfighting, and 3) integrating operations. These core competencies make six distinctive capabilities possible: 1) air and space superiority, 2) global attack, 3) rapid global mobility, 4) precision engagement, 5) information superiority, and 6) agile combat support (http://www.laughlin.af.mil/main/welcome.asp).

1.8.2 Wildlife Services

The USDA is authorized and directed by law to protect American agriculture and other resources from damage associated with wildlife. The primary statutory authority for the WS program is the Act of March 2, 1931, as amended (7 U.S. C. 426-426c; 46 Stat. 1468) and the Rural Development, Agriculture, and Related Agencies Appropriations Act of 1988 (P.L. 100-202) Dec. 27, 1987. Stat. 1329-1331 (7 U.S.C. 426c), and the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act of 2001, Public Law 106-387, October 28, 2000. Stat. 1549 (Sec 767). WS activities are conducted in cooperation with other federal, state and local agencies; and private organizations and individuals. Federal agencies, including the United States Fish and Wildlife Service (USFWS), the FAA and USAF, recognize the expertise of WS to address wildlife damage issues related reducing human/wildlife conflicts.

WS' mission is to "provide leadership in wildlife damage management[9] in the protection of America's agricultural, industrial and natural resources, and to safeguard public health and safety." This is accomplished through:

- Training of wildlife damage management professionals
- Development and improvement of strategies to reduce economic losses and threats to humans from wildlife
- Collection, evaluation, and dissemination of management information
- Cooperative wildlife damage management programs
- Informing and educating the public on how to reduce wildlife damage
- Providing data and a source for limited-use management materials and equipment, including pesticides (USDA 1999).

1.8.3 Texas Wildlife Services

The Texas WS program is a cooperatively funded effort between WS, the State of Texas through the Texas A&M University System/Texas Cooperative Extension Service and the Texas Wildlife Damage Management Association. The Texas WS program has a cooperative agreement in place to provide assistance to LAFB to minimize human/wildlife conflicts on the base. The majority of the activities conducted under the agreement involve minimizing wildlife strike hazards to LAFB aircraft and reducing human health and safety risks. WS' activities include evaluation of wildlife attractants, recommendations for habitat management, non-lethal harassment of birds and mammals away from the airfield and lethal removal of birds and mammals to reinforce non-lethal harassment as well as eliminate direct hazards; WS' activities on LAFB are covered under NEPA by an agency CE. The lethal component of WS' human/bird conflict reduction activities are further covered by a USFWS permit, which also includes NEPA analysis of the action (including cumulative effects) by the USFWS.

1.8.4 Compliance with other Federal Laws and Executive Orders

Several other federal laws authorize, regulate, or otherwise affect wildlife damage management.

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this analysis.

9 Wildlife damage management, or reducing human/wildlife conflicts, is defined as the alleviation of damage or other problems caused by or related to the presence of wildlife, and are an integral component of wildlife management (Leopold 1933, The Wildlife Society 1990, Berryman 1991). The WS program uses an IWDM approach (sometimes referred to as Integrated Pest Management or IPM) in which a combination of methods may be used or recommended to reduce wildlife damage/conflicts. IWDM is described in Chapter 1, 1-7 of USDA (1997).

1.8.4.1 National Environmental Policy Act (NEPA)

WS prepares analyses of the environmental impacts of program activities to meet procedural requirements of this law. This EA meets the NEPA requirement for the proposed action at LAFB. While NEPA compliance is the responsibility of LAFB for this action WS has agreed to complete NEPA documentation due to our specialized expertise and jurisdiction by law.

1.8.4.2 Endangered Species Act (ESA)

It is federal policy, under the ESA, that all federal agencies shall seek to conserve threatened and endangered (T&E) species and shall utilize their authorities in furtherance of the purposes of the Act (Sec.2(c)). WS conducts Section 7 consultations with the USFWS to use the expertise of the USFWS to ensure that "any action authorized, funded or carried out by such an agency . . . is not likely to jeopardize the continued existence of any endangered or threatened species . . . Each agency shall use the best scientific and commercial data available" (Sec.7(a)(2)). WS has reviewed the list of T&E species in the project area and has determined that the proposed action and all of the alternatives will have "no effect" on listed or candidate species.

1.8.4.3 Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-711; 40 Stat. 755), as amended

The MBTA provides the USFWS regulatory authority to protect families of birds that contain species that migrate outside the United States. The law prohibits any "take" of these species, except as permitted by the USFWS; therefore the USFWS issues permits for reducing bird damage. No direct take of migratory birds is anticipated from this proposed action. Take of migratory birds has been allowed under USFWS Migratory Bird Permit MB810535-0. Incidental take of migratory birds is allowed under "Take of Migratory Birds by the Armed Forces" (Federal Register 72(39):8931-8950) that allows incidental take during active military activities. WS anticipated the proposed action will not "take" migratory birds, either directly or indirectly, using the definition of take found in the MBTA. However, should some incidental take result from an individual bird not finding food on the AOA, this is both allowable (Federal Register 72(39):8931-8950) and preferable to the direct risk posed to aircraft from an aircraft/bird strike.

1.8.4.4 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

FIFRA requires the registration, classification, and regulation of all pesticides used in the United States. The Environmental Protection Agency (EPA) is responsible for implementing and enforcing FIFRA. All chemical methods used or recommended by the WS program at LAFB are registered with and regulated by the EPA and Texas Department of Agriculture, and are used by WS in compliance with labeling procedures and requirements.

1.8.4.5 National Defense Authorization Act

The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulations promulgated by the Secretary of the Interior. However on December 2, 2002, President Bush signed the 2003 National Defense Authorization Act (Authorization Act). Section 315 of the Authorization Act provides that, not later than one year after its enactment, the Secretary of the Interior (Secretary) shall exercise his/her authority under Section 704(a) of the MBTA to prescribe regulations to exempt the Armed Forces for the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense or the Secretary of the military department concerned. The Authorization Act further requires the Secretary to promulgate such regulations with the concurrence of the Secretary of Defense. In passing the Authorization Act, Congress itself determined that allowing incidental take of migratory birds as a result of military readiness activities is consistent with the MBTA and the treaties. With this language, Congress clearly expressed its intention that the Armed Forces give appropriate consideration to the protection of migratory birds when planning and executing military readiness activities, but not at the expense of diminishing the effectiveness of such activities. Rules have been developed by the USFWS in coordination and cooperation with the Department of Defense and the Secretary of Defense concurs with the requirements herein (Federal Register 72:8931-8950, 50 CFR part 21). As directed by Section 315 of the Authorization Act, this rule authorizes such take, with limitations, that result from military readiness activities of the Armed Forces. If any of the Armed Forces determine that a proposed or an ongoing military readiness activity may result in a significant adverse effect on a population of a migratory bird species, then they must confer and cooperate with the USFWS to develop appropriate and reasonable conservation measures to minimize or mitigate identified significant adverse effects.

1.8.4.6 National Historic Preservation Act (NHPA) of 1966 as amended

The National Historic Preservation Act (NHPA) of 1966, and its implementing regulations (36 CFR 800), requires federal agencies to: 1) determine whether activities they propose constitute "undertakings" that can result in changes in the character or use of historic properties and, 2) if so, to evaluate the effects of such undertakings on such historic resources and consult with the State Historic Preservation Office regarding the value and management of specific cultural, archaeological and historic resources, and 3) consult with appropriate American Indian Tribes to determine whether they have concerns for traditional cultural properties in areas of these federal undertakings. Activities as described under the proposed action do not cause ground disturbances nor do they otherwise have the potential to significantly affect visual, audible, or atmospheric elements of historic properties and are thus not undertakings as defined by the NHPA. WS has determined that human/wildlife conflict reduction actions are not undertakings as defined by the NHPA because such actions do not have the potential to result in changes in the character or use of historic properties.

1.8.4.7 Executive Order 12856 - "Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements"

Ensures that all federal agencies conduct their facility management and acquisition activities so that, to the maximum extent practicable, the: 1) quantity of toxic chemicals entering any wastestream, including any releases to the environment, is reduced as expeditiously as possible through source reduction; 2) that waste that is generated is recycled to the maximum extent practicable; 3) that any wastes remaining are stored, treated or disposed of in a manner protective of public health and the environment; 4) to report in a public manner toxic chemicals entering any wastestream from their facilities, including any releases to the environment; 5) to improve local emergency planning, response, and accident notification; 6) to help encourage markets for clean technologies and safe alternatives to extremely hazardous substances or toxic chemicals through revisions to specifications and standards, the acquisition and procurement process; and 7) the testing of innovative pollution prevention technologies at federal facilities or in acquisitions.

Further, the head of each Federal agency is responsible for ensuring that all necessary actions are taken for the prevention of pollution with respect to that agency's activities and facilities, and for ensuring that agency's compliance with pollution prevention and emergency planning and community right-to-know provisions established pursuant to all implementing regulations issued pursuant to Emergency Planning and Community Right-to-Know Act (EPCRA). Table 1-2 describes the criteria summary and thresholds for chemicals listed in and the limits for chemicals in the EPCRA. Carbaryl is listed as a Section 313 chemical and usage by a federal agency must comply with the thresholds established in the EPCRA.

Table 1-2: EPCRA Chemicals and Reporting Thresholds

	Section 302	Section 304	Sections 311/312	Section 313
Chemicals	356 extremely hazardous	>1,000 substances	500,000 products	650 toxic chemicals
Thresholds	Threshold Planning Quantity 1-10,000 pounds on site at any one time	Reportable quantity, 1-5,000 pounds released in a 24-hour period	TPQ or 500 pounds for Section 302 chemicals; 10,000 pounds on site at any one time for other chemicals	25,000 pounds per year manufactured or processed; 10,000 pounds a year used; certain persistent bioaccumulative toxics have lower thresholds

1.8.4.8 Environmental Justice and Executive Order 12898 – "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

Executive Order 12898, entitled, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" promotes the fair treatment of people of all races, income levels and cultures with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Environmental justice is the pursuit of equal justice and protection under the law for all environmental statutes and regulations without discrimination based on race, ethnicity, or socioeconomic status. It is a priority within APHIS and WS. Executive Order 12898 requires Federal agencies to make environmental justice part of their mission, and to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies and activities on minority and low-income persons or populations. APHIS implements Executive Order 12898 principally through its compliance with NEPA. All WS activities are evaluated for their impact on the human environment and compliance with Executive Order 12898. WS personnel use only legal, effective, and environmentally safe wildlife damage management methods, tools, and approaches. It is not anticipated that the proposed action would result in any adverse or disproportionate environmental impacts to minority and low-income persons or populations.

1.8.4.9 Executive Order 13045 – "Protection of Children from Environmental Health and Safety Risks"

Children may suffer disproportionately from environmental health and safety risks for many reasons. Wildlife damage management as proposed in this EA would only involve legally available and approved damage management methods in situations or under circumstances where it is highly unlikely that children would be adversely affected. Therefore, implementation of the proposed action would not increase environmental health or safety risks to children.

1.8.4.10 Executive Order 13112 - Invasive Species

Executive Order 13112 directs Federal agencies to use their programs and authorities to prevent the spread or to control populations of invasive species that cause economic or environmental harm, or harm to human health. Pigeons, starlings, and English sparrows are recognized as invasive species that have adverse economic, ecological, and human health impacts.

1.8.4.11 Executive Order 13186 of January 10, 2001 - "Responsibilities of Federal Agencies to Protect Migratory Birds." This Order states that each federal agency, taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations, is directed to develop and implement a MOU with the USFWS that shall promote the conservation of migratory bird populations. The proposed action has no negative effects on migratory birds and, to the contrary, will support the conservation of birds by reducing the risk to individual birds from air strikes.

CHAPTER 2 - ISSUES

2.1 INTRODUCTION

Chapter 2 contains a discussion of the issues, including issues that will receive detailed environmental impacts analysis in Chapter 4 (Environmental Consequences), issues that have driven the development of minimization measures and/or standard operating procedures (SOP), and issues that will not be considered in detail, with rationale. Pertinent portions of the affected environment will be included in this chapter in the discussion of issues used to develop SOPs. Additional description of affected environments will be incorporated into the discussion of the environmental impacts in Chapter 4.

2.2 AFFECTED ENVIRONMENT

Habitats differ from one airport to another, although they all have one thing in common – all airports provide habitat for some type of wildlife that can cause hazards to aircraft. The affected area includes about 700 acres of the AOA at LAFB. The areas surrounding LAFB contain a variety of habitats from lakes and wetlands to woodlands, native grasslands, croplands, and suburban areas, but the proposed project will have no effect on areas outside the 700 acre AOA area.

2.3 ISSUES. The following issues have been identified as areas of concern requiring consideration in this EA and will be analyzed in detail in Chapter 4:

- Effects on Target Wildlife, including T&E Species found in the LAFB AOA
- Efficacy to Reduce the Risk of Strikes
- Effects on Human Health and Safety

2.4 ISSUES ADDRESSED IN THE ANALYSIS OF ALTERNATIVES

Insects are a food source for many wildlife species and serve as an important role in nutrient cycling; however, insect abundance can affect bird/aircraft strikes at LAFB. Insect management involves a wide variety of actions of which the ultimate goal of this project is to prevent or drastically reduce the aircraft/bird strike risk to pilots and aircraft. Reducing strike risks is primarily the responsibility of the USAF. It is the USAF who is best able to make decisions and set priorities for actions that will affect operations at LAFB. A comprehensive strike reduction program would have several components, including WS operational management and a chemical strategy to reduce strike risks. Among the factors that contribute to insect population fluctuations are temperature, precipitation, vegetation, soil qualities, natural enemies, as well as many other parameters—some of which remain to be discovered.

2.4.1 Effects on Wildlife, including T&E Species found in the LAFB AOA

A common concern for LAFB and WS personnel and the public is whether human/wildlife conflict reduction actions adversely affect the viability of wildlife populations. WS' SOPs include measures intended to mitigate or reduce the effects on wildlife populations as a result of bird/aircraft strike risk reduction and are presented in Chapter 3. The species listed in Table 1-1 are those species potentially responsible for aircraft/birds strikes. Any insecticide treatment would target the food base for insectivorous wildlife in any effort to reduce strike risks. Even without insect management, a minimal number of species listed in Table 1-1 are likely to be directly killed by WS' use of lethal management methods under the proposed action in any one year. Special efforts are made to avoid jeopardizing T&E Species through biological assessments of the potential effects and the establishment of special restrictions or mitigation measures, as necessary. WS has consulted with the USFWS under Section 7 of the ESA concerning potential impacts of management actions on T&E species and has obtained a Biological Opinion (BO) (USDA 1997). WS has obtained and reviewed the lists of Federal and Stated listed T&E species found in Texas. WS and LAFB have made a "no effect" determination for those species that could occur at LAFB from implementing the proposed action because the species are not insectivorous or would not be in the area during any treatment. Individual numbers of bird and mammal species taken by WS in FY05 and 06 in Tables 4-1 and 4-2, respectively.

The USFWS Migratory Bird Permit Office has concurred with WS that there is no adverse effect on federally protected migratory bird populations because of WS' wildlife damage management activities at LAFB (USFWS Migratory Bird Permit # MB810535-0).

2.4.2 Efficacy to Reduce the Risk of Strikes

A major concern and the objective of this proposed action is to reduce bird/aircraft strike risks and the subsequent damage, injury or death of the crew and ground personnel from a bird strike. As the efforts to reduce strikes diminishes, the risk to aircraft and crews increases. LAFB personnel are concerned as to whether the proposed action or any of the alternatives would reduce aircraft strike risks to more acceptable levels. Wildlife has and could cause damage to aircraft and property as described in the need for action.

Laughlin AFB is the home of the 47th Flying Training Wing which has approximately 400 military pilots who earn their silver wings each year after 52-weeks of training. As a military training center, LAFB is required to provide a safety environment for pilots and crews. On December 2, 2002, President Bush signed the 2003 National Defense Authorization Act (Authorization Act). Section 315 of the Authorization Act provides that, under Section 704(a) of the MBTA the Armed Forces is exempt for the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense or the Secretary of the military department concerned. In passing the Authorization Act, Congress itself determined that allowing incidental take of migratory birds as a result of military readiness activities is consistent with the MBTA and the treaties. With this language, Congress clearly expressed its intention that the Armed Forces give appropriate consideration to the protection of migratory birds when planning and executing military readiness activities, but not at the expense of diminishing the effectiveness of such activities. The USFWS promulgated rules on the military take of migratory birds on February 8, 2007 (50 CFR Part 21). This rule was developed by the USFWS in coordination and cooperation with the Department of Defense and the Secretary of Defense concurs with the requirements.

2.4.3 Effects on Human Health and Safety

2.4.3.1 Safety and Efficacy of Chemical Control Methods

Some individuals may have concerns that chemicals used to reduce bird strike risks should not be used because of potential adverse effects from exposure to the chemicals or to the insects that have died as a result of chemical use. Under the proposed alternative, the insecticide proposed for use is carbaryl (*i.e.*, sevin). The use of carbaryl is strictly regulated through the EPA (through FIFRA) and the Texas Department of Agriculture.

2.4.3.2 Impacts on Human Safety from Wildlife Strike Hazards

The concern stated here is that in the absence of adequate aircraft/bird strike reduction efforts the results would be an adverse effect on human health and safety and increased property damage because bird and mammal strikes on aircraft would not be curtailed or reduced to the minimum levels possible and practical. The potential impacts of not conducting such work could lead to increased damage and incidences of injuries or loss of human lives from wildlife strikes to aircraft.

2.5 ISSUES NOT CONSIDERED IN DETAIL WITH RATIONALE

2.5.1 Effects on Human Affectionate-Bonds with Individual Animals and on Aesthetic Values of Wildlife Species

The human attraction to animals has been well documented throughout history and started when humans began domesticating animals. The American public is no exception and today a large percentage of households have pets. However, some people may consider individual wild animals and birds as "pets" or exhibit affection toward these animals, especially people who enjoy coming in contact with wildlife. Therefore, the public reaction is variable and mixed to wildlife damage management because there are numerous philosophical, aesthetic, and personal attitudes, values, and opinions about the best ways to manage conflicts/problems between humans and wildlife.

Some individual members or groups of wildlife species habituate and learn to live in close proximity to humans. Some people in these situations feed such birds/mammals and/or otherwise develop emotional attitudes toward wildlife that result in aesthetic enjoyment. In addition, some people consider individual wild animals as "pets," or exhibit affection toward these animals. Examples would be people who visit a city park to feed waterfowl or pigeons and homeowners who have bird feeders or birdhouses. Many people do not develop emotional bonds with individual wild animals, but experience aesthetic enjoyment from observing them.

There is some concern that the proposed action or the alternatives would result in the loss of aesthetic benefits to the public, resource owners, or neighboring residents. Wildlife generally is regarded as providing economic, recreational, and aesthetic benefits (Decker and Goff 1987), and the mere knowledge that wildlife exists is a positive benefit to many people. Aesthetics is the philosophy dealing with the nature of beauty, or the appreciation of beauty. Therefore, aesthetics are truly subjective in nature, dependent on what an observer regards as beautiful.

Wildlife populations provide a range of social and economic benefits (Decker and Goff 1987). These include direct benefits related to consumptive and non-consumptive use (*e.g.*, wildlife-related recreation, observation, harvest, sale), indirect benefits derived from vicarious wildlife related experiences (*e.g.*, reading, television viewing), and the personal enjoyment of knowing wildlife exists and contributes to the stability of natural ecosystems (*e.g.*, ecological, existence, bequest values) (Bishop 1987). Direct benefits are derived from a user's personal relationship to animals and may take the form of direct consumptive use (using up the animal or intending to) or non-consumptive use (viewing the animal in nature or in a zoo, photography) (Decker and Goff 1987). Indirect benefits or indirect exercised values arise without the user being in direct contact with the animal and come from experiences such as looking at photographs and films of wildlife, reading about wildlife, or benefiting from activities or contributions of animals such as their use in research (Decker and Goff 1987). Indirect benefits come in two forms: bequest and pure existence (Decker and Goff 1987). Bequest is providing for future generations and pure existence is merely knowledge that the animals exist (Decker and Goff 1987).

Public reaction to damage management actions is variable because individual members of the public can have widely different attitudes toward wildlife. Some individuals who are negatively affected by wildlife support removal or relocation of damaging wildlife. Other individuals affected by the same wildlife may oppose removal or relocation. Individuals unaffected by wildlife damage may be supportive, neutral, or opposed to wildlife removal depending on their individual personal views and attitudes.

Some people do not believe that individual animals or nuisance birds should even be harassed to stop or reduce damage problems. Some of them are concerned that their ability to view birds and other wildlife species are lessened by WS non-lethal harassment efforts. The proposed action is a non-lethal, non-harassment activity. Aesthetic enjoyment of birds to members of the public is not generally considered for a closed environment such as an Air Force Base. For these reasons, this issue will not be considered in detail in this EA.

2.5.1.1 Effects on Aesthetic Values of Property Damaged by Wildlife

USAF personnel have expressed concerns about aircraft/bird strikes and damage to structures and are concerned about the negative effects from bird droppings. Costs associated with property damage include labor and disinfectants to clean/sanitize fecal droppings, implementation of non-lethal wildlife management methods, loss of property use, and loss of aesthetic value of landscape vegetation where birds occur has increased risks to human health and safety.

2.5.2 Humaneness and Animal Welfare Concerns of Lethal Methods Used by WS

The issue of humaneness and animal welfare, as it relates to the killing or capturing of animals is an important but very complex concept that can be interpreted in a variety of ways. Schmidt (1989) indicated that vertebrate pest damage management for societal benefits could be compatible with animal welfare concerns, if ". . . the reduction of pain, suffering, and unnecessary death is incorporated in the decision making process."

Suffering is described as a "... highly unpleasant emotional response usually associated with pain and distress." However, suffering "... can occur without pain..." and "... pain can occur without suffering." (AVMA 1987). Because suffering carries with it the implication of a time frame, a case could be made for "... little or no suffering where death comes immediately..." (CDFG 1999).

Defining pain as a component in humaneness of WS methods appears to be a greater challenge than that of suffering. Pain obviously occurs in animals. Altered physiology and behavior can be indicators of pain, and identifying the causes that elicit pain responses in humans would "... probably be causes for pain in other animals"(AVMA 1987). However, pain experienced by individual animals probably ranges from little or no pain to significant pain (CDFG 1999).

Pain and suffering, as it relates to WS damage management methods, has both a professional and lay point of arbitration. Wildlife managers and the public would be better served to recognize the complexity of defining suffering, since "... neither medical or veterinary curricula explicitly address suffering or its relief" (CDFG 1999).

Therefore, humaneness, in part, appears to be a person's perception of harm or pain inflicted on an animal, and people may perceive the humaneness of an action differently. The challenge in coping with this issue is how to achieve the least amount of animal suffering within the constraints imposed by current technology and funding.

WS has improved the selectivity and humaneness of management techniques through research and development. The addition of approved chemical capture/euthanasia procedures has allowed WS personnel to meet veterinary humane criteria. Research is continuing to bring new findings and products into practical use. Until new findings and products are found practical, a certain amount of animal suffering could occur when some management mechanical methods are used in situations where non-lethal damage management methods are not practical or effective.

2.5.3 Impact on Biodiversity.

No bird damage management is conducted to eradicate or adversely impact populations of any native wildlife species. Wildlife damage management programs operate according to international, federal, and state laws and regulations (and management plans thereof) enacted to ensure species viability. In addition, any reduction of a local population or group is frequently temporary because immigration from adjacent areas or reproduction replaces the animals removed. The effects of the current program on biodiversity are minor and not significant nationwide, statewide, or regionally (USDA 1997). The current operational program targets primarily birds at LAFB that are causing or potentially causing a bird strike that could injury or kill pilots and crews, and cause damage to property. Take of any bird species analyzed in this EA is a small proportion of the total population and insignificant to the viability and health of the population (Sauer et al. 2007).

2.5.4 Cost Effectiveness of Bird Damage Management.

Perhaps a better way to state this issue is by the question "Does the value of damage avoided equal or exceed the cost of providing bird damage management?" CEQ does not require a formal, monetized cost-benefit analysis to comply with NEPA (40 CFR 1502.23) and consideration of this issue is not essential to making a reasoned choice among the alternatives being considered. USDA (1997, Appendix L) states:

"Cost effectiveness is not, nor should it be, the primary goal of the APHIS WS program. Additional constraints, such as the environmental protection, land management goals, and others, are considered whenever a request for assistance is received. These constraints increase the cost of the program while not necessarily increasing its effectiveness, yet they are a vital part of the APHIS WS Program."

An analysis of cost-effectiveness in many bird damage management situations is exceedingly difficult or impossible to perform because the value of benefits is not readily determined (*i.e.*, human health and safety or injury). Further, the potential benefit of eliminating birds from an AOA could reduce incidences of strikes, thus reducing property damage.

Standard economic theories require predictability of an event to calculate benefit:cost ratios. While the proposed action is designed to lessen the risk of a bird strike, the costs of the strikes avoided cannot be predicted. Costs of bird strikes at LAFB have ranged from $0 to $6.2 million. The highly variable costs associated with future bird strikes makes a benefit:cost analysis impossible to accurately calculate.

CHAPTER 3: ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 INTRODUCTION

This chapter consists of four parts: 1) an introduction, 2) description of alternatives considered and analyzed in detail including the No Action (Alternative 1) and Proposed Action (Alternative 2), 3) Alternatives considered but not in detail, with rationale, and 4) Standard Operating Procedures (SOPs) for wildlife damage management.

Alternatives were developed for consideration using the WS Decision Model (Slate et al. 1992), *"Methods of Control"* (USDA 1997, Appendix J) and the *"Risk Assessment of Wildlife Damage Control Methods Used by the USDA Animal Damage Control Program"* (USDA 1997, Appendix P).

Alternatives analyzed in detail are:

Alternative 1 – Continue the Current IWDM Human/Wildlife Conflict Reduction Program (No Action Alternative).
Alternative 2 – Enhanced Adaptive Bird Strike Risk Reduction through Carbaryl Application (Proposed Action Alternative).
Alternative 3 – Additional Operational Lethal and Nonlethal Bird Strike Risk Reduction.

3.2 DESCRIPTION OF THE ALTERNATIVES

3.2.1 Alternative 1 – Continue the Current IWDM Human/Wildlife Conflict Reduction Program (No Action).

A variety of wildlife/human conflict reduction services[10] have been and are currently being provided by WS to reduce hazards at LAFB. This alternative would continue the current IWDM program at LAFB to reduce birds strike to aircraft and protect property and human health and safety. Operational assistance currently involves one full-time WS Wildlife Biologist to assist with wildlife hazard management activities. The current IWDM strategy implements the use of legally available techniques, as described below, used singly or in combination to reduce bird strikes and other conflicts with wildlife affecting the use of the airfield and safe airport operations. Lethal methods used by WS include shooting, or euthanasia following live capture or trapping. Non-lethal methods used by WS may include habitat alteration, chemical immobilization, repellents, barriers and deterrents, netting, and harassment or scaring devices. In many situations, the implementation of non-lethal methods such as habitat alteration, structural modifications, and barriers is the responsibility of the LAFB to implement. All management actions would comply with appropriate federal, state, and local laws.

3.2.2 Alternative 2 – Enhanced Adaptive Bird Strike Risk Reduction through Carbaryl Application (Proposed Action).

At LAFB there is the continuing risk of wildlife/aircraft strikes which could result in human injury or death of the aircrew, or personnel on the ground and substantial damage to property and aircraft from birds (Table 1-1). The proposed action is to supplement the current WS program at LAFB to include food base management of migratory birds to further protect aircraft and human health and safety by implementation of insect management as a non-lethal bird and mammal damage management method. This alternative would incorporate the use of carbaryl[11] (*i.e.*, sevin) to further reduce wildlife strike/damage risks. Treatments involving the use of carbaryl at EPA label rates are temporary and would most likely impact the affected area for short periods of time. The management of insect populations and resultant bird and mammal food source as a non-lethal bird and mammal damage management activity may be necessary to further reduce the risk of a wildlife strike.

3.2.3 Alternative 3 – Additional Operational Lethal and Nonlethal Bird Strike Risk Reduction.

Under this alternative, LAFB would provide funding for additional WS personnel to provide additional nonlethal and lethal operational and technical assistance services. Appendix B describes a number of nonlethal

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[10] These services include technical assistance, wildlife hazard assessments, wildlife hazard management plans, and operational assistance.

[11] To further protect aircraft and human health and safety, it is important to analyze all legally available methods to reduce risks.

and lethal methods available for use by WS under this alternative.

3.3 ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL WITH RATIONALE

3.3.1 Additional Pesticide Use for Insect Management

This alternative would implement the use of additional insecticides to reduce bird strike risks to aircraft and protect human health and safety. Several insecticides have been proposed for use to reduce insect populations and reduce the risk for a bird/aircraft strike. These insecticides are:

- Tempo® 20 or Cyfluthrin - Cyfluthrin is a synthetic pyrethroid insecticide that has both contact and stomach poison action. Its primary agricultural uses have been for control of chewing and sucking insects on crops such as cotton, turf, ornamentals, hops, cereal, corn, deciduous fruit, peanuts, potatoes, and other vegetables. Cyfluthrin is also used in public health situations and for structural pest control. It is considered moderately toxic to mammals. The oral LD_{50} of cyfluthrin ranged from 869 - 1271 mg/kg in rats, 291 - 609 mg/kg in mice, >1000 mg/kg in sheep, > 100 mg/kg in dogs and > 1000 mg/kg in rabbits (Pesticide Residues in Food-1987). Although cyfluthrin is used in many applications, both indoor and for agricultural crop protection, there is no EPA registration for outdoor noncropland applications and therefore cannot legally be used to treat the AOA at LAFB.

- Malathion - Malathion is an organophosphate, broad spectrum insecticide that has been widely used for many years in agriculture, public health, and in homes and gardens. The mode of action for malathion is similar to carbaryl in that malathion primarily acts as an AChE inhibitor. Malathion acts as both a contact insecticide and a stomach poison, although ingestion results in a greater percentage of mortality. Malathion is recommended for use against grasshoppers during warm and dry conditions (Foster and Onsager 1996), and the quick action of malathion will result in mortality before grasshoppers mature and lay eggs. Malathion is of slight acute oral toxicity to humans and other msmmals[12] and it is slightly to moderately toxic to birds. EPA has recently reviewed the potential for carcinogenic effects from malathion. EPA's classification describes malathion as having "suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential." This indicates that any carcinogenic potential of malathion cannot be quantified based upon EPA's weight of evidence determination in this classification (EPA, 2000). Futher, while malathion is not directly toxic to vertebrates at the concentrations used for grasshopper suppression, it may be possible that sublethal effects to nervous system functions caused by AChE inhibition may lead indirectly to decreased survival. Therefore, based on the EPA's classification which described malathion as having "suggestive evidence of carcinogenicity," its use will not be considered further as a treatment insecticide at LAFB to reduce bird strike risks.

- Insect Growth Regulators - Growth-regulating insecticides generally have a narrower spectrum of activity. Diflubenzuron, for example, causes mortality to immature insects by inhibiting chitin formation. At very low doses, diflubenzuron inhibits the ability of immature insects to synthesize chitin at the time of molting which prevents insects from forming their exoskeleton, or outer shell, causing death due to cuticle rupture or starvation. Because diflubenzuron is effective against immature insects, diflubenzuron can most effectively be used early in the treatment season. In many cases, the "window of opportunity" for applying diflubenzuron may be earlier than for traditional pesticides such as malathion or carbaryl. The toxicity of diflubenzuron is much greater to immature invertebrates whose required chitin production is inhibited by this insecticide. Diflubenzuron is highly toxic to larval stages of insects but is not toxic to adult insects that have already formed their exoskeleton and are unaffected. Based on the mode of action of insect growth regulators, their use would still allow adult insects to be present and available for birds forage. Therefore insect growth inhibitor use on LAFB to reduce bird strikes will not be considered further

3.3.2 Non-chemical Insect Management

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[12] Reported oral LD50 values of 1000 mg/kg to greater than 10,000 mg/kg in the rat, and 400 mg/kg to greater than 4000 mg/kg in the mouse.

The USAF could take several actions in an attempt to reduce insect populations. These preventative actions include cultural, mechanical, and biological methods that must be employed over a long period of time to reach effectiveness. This alternative would implement the use of non-chemical insect management procedures, such as, mechanically managing grass height, implementing brush and water management, or denuding areas of the AOA of vegetation to reduce habitats that could support grasshoppers and other insects. By managing the areas in a different manner, habitats would be changed to discourage insectivorous birds from using the sites. However, habitat changes could bring other bird species to the sites and therefore not reduce the bird strikes risks but simply replaces one species of bird for other species of non-insectvorous birds.

3.5 STANDARD OPERATING PROCEDURES FOR THE PROPOSED ACTION

SOPs are any features of an action that serve to prevent, reduce, or compensate for impacts that otherwise might result from that action. The current program at LAFB uses many such procedures and these are discussed in detail in Chapter 5 of USDA (1997). Some key SOPs pertinent to the proposed action and alternatives that are incorporated into WS' Standard Operating Procedures include:

SOPs	Alternatives		
	1	2	3
Animal Welfare and Humaneness of Methods used by WS			
Research on selectivity and humaneness of management practices would be monitored and adopted as appropriate.	X	X	X
The Decision Model (Slate et al. 1992) is used to identify effective biological and ecologically sound strategies and their impacts.	X	X	X
Captured non-target animals are relocated unless it is determined by the WS personnel that the animal would not survive	X		
The use of traps and snares conform to current laws and regulations administered by TPWD and WS policy.	X		X
Euthanasia procedures approved by the AVMA that cause minimal pain are used for live animals.	X		X
Chemical Agents are used according to the Drug Enforcement Agency, FDA, EPA and WS program policies and directives and procedures.	X	X	X
The use of newly developed, proven methods would be encouraged when appropriate.	X	X	
Safety Concerns Regarding WS Wildlife Damage Management Methods			
All pesticide use is guided by the EPA label and pesticides are registered with the EPA and Texas Department of Agriculture		X	X
The Decision Model (Slate et al. 1992), designed to identify the most appropriate damage management strategies and their impacts, is used to determine strategies.	X	X	X
WS employees that use pesticides are trained to use each material and are certified to use pesticides under EPA approved certification programs.		X	
WS employees that use controlled substances are trained to use each material and are certified to use controlled substances under Agency certification program.	X	X	X
WS employees who use pesticides and controlled substances participate in State approved continuing education to keep abreast of developments and maintain their certifications.		X	
Pesticide and controlled substance use, storage, and disposal conform to label instruction and other applicable laws and regulations, and Executive Order 12898.		X	
Material Safety Data Sheets for pesticides and controlled substances are provided to all WS personnel involved with specific wildlife damage management activities.		X	
Concerns about Impacts of Wildlife Damage Management on Target Species, Species of Special Concern, and Non-target Species			
Management actions would be directed toward localized populations or groups and/or individual offending animals.	X	X	X
WS personnel are trained and experienced to select the most appropriate methods for	X	X	X

taking targeted animals and excluding non-target species.			
WS would initiate informal consultation with the USFWS following any incidental take of T &E species.	X	X	X
The presence of non-target species is monitored before using pesticides to reduce the risk of mortality of non-target species populations.		X	X
WS take is monitored by number of animals by species or species groups with overall populations or trends in population to assure the magnitude of take is maintained below the level that would cause significant adverse impacts to the viability of native species populations (See Chapter 4).	X	X	X
WS uses chemical methods that have undergone rigorous research to prove their safety and lack of serious effects on non-target animals and the environment.		X	

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

Chapter 4 describes the potential to affect human health, environmental quality, and wildlife species and provides information needed for making informed decisions to select the appropriate alternative for meeting the objectives and purpose of the proposed action. The consequences are based on the analysis of the alternatives, including Alternative 2 and the maximum rate of application of carbaryl for this project. The risks to health are assessed quantitatively and characterized by potential health outcome of the alternatives. The risks to environmental quality of the physical environment are presented qualitatively. The chapter analyzes the environmental consequences of each alternative in relation to the issues identified for detailed analysis in Chapter 2. This chapter analyzes the environmental consequences of each alternative compared to the No Action Alternative[13] (Alternative 1) to determine if the real or potential impacts would be greater, lesser, or the same. Therefore, the No Action Alternative serves as the baseline for the analysis and the comparison of expected impacts among the alternatives. The information presented in the analysis of the current program also applies to the analysis of each of the other alternatives.

4.2 ENVIRONMENTAL CONSEQUENCES

The following resource values at LAFB are not expected to be adversely affected by the alternatives analyzed: soils, geology, minerals, water quality/quantity, flood plains, wetlands, visual resources, air quality, prime and unique farmlands, aquatic resources, timber, wilderness, and range. In addition, no issues have been identified relative to aircraft/bird strike risk reductions that are inconsistent with EO 12856, 12898, 13045, 13112, or 13186 (see Section 1.8.4).

4.2.1 Social and Recreational Concerns: It is not anticipated that the proposed action would result in any adverse cumulative effects to social and recreational resources. The proposed action is to treat about 700 acres within LAFB with carbaryl, a registered pesticide[14], to reduce insect populations and risk of aircraft/bird strikes. Further LAFB is a closed facility that does not allow public recreational activities and therefore these resources will not be affected.

4.2.2 Wastes (Hazardous and Solid): It is not anticipated that the proposed action would result in any adverse cumulative effects from solid or hazardous wastes.

4.2.3 Target and Non-target Wildlife Species: Cumulative impacts to potentially affected target and non-target species' populations are addressed in detail in Section 4.3.1.

4.2.4 Irreversible and Irretrievable Commitments of Resources: Other than the minor uses of fuels for motor vehicles and electricity for office operations, no irreversible or irretrievable commitments of resources result from the proposed project. Based on these estimates, the proposed project has negligible effects on the supply of fossil fuels and electrical energy.

4.2.5 Cumulative and Unavoidable Impacts: Cumulative and unavoidable impacts of each alternative to target and non-target populations are discussed and analyzed in this chapter (Section 4.3) and effects from this management plan are discussed in relationship to bird species/groups; the proposed project is a non-lethal bird management action. This EA recognizes that the total annual removal[15] of birds by all causes is the cumulative mortality. Cumulative impacts would be mortality caused by the project and other known causes of mortality (USDA 1997). It is not anticipated that the proposed action would result in any adverse cumulative effects to bird/wildlife populations, including T/E species.

Analysis of LAFB bird "*take,*" combined with other possible mortality, indicates that cumulative annual impacts would not be significant, and through close cooperation and consultation with the USFWS and TPWD,

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[13] The No Action Alternative, as defined here, is consistent with the Council on Environmental Quality (CEQ) (1981).

[14] All treatments using carbaryl will be in strict accordance with the EPA-label directions.

[15] It is recognized that the other mortality of wildlife (*i.e.*, road kills, disease, natural mortality, etc.) occurs throughout Iowa but no reliable system exists for recording this information.

none of the alternatives analyzed in this EA are expected to adversely affect bird populations. The proposed project is not expected to have any adverse cumulative effects on non-target wildlife or their habitats, including T/E species. Furthermore, human/bird conflict reduction at LAFB, as implemented by WS, would not jeopardize public health and safety, but would enhance public safety.

Preference is given to non-lethal management when practical and effective (WS Directive 2.101). Lethal damage management is implemented when a bird damage management problem cannot be resolved effectively through implementation of non-lethal techniques or when used to reinforce hazing techniques and where *Agreements for Control* or other comparable documents provide for operational damage management.

DPs are necessary under the MBTA for activities related to migratory bird damage management. DPs are not necessary for non-lethal harassment of species protected only under MBTA, but a Section 7 consultation and permit could be required to conduct damage management on migratory birds listed under the ESA. The USFWS has authority for managing migratory birds and issuance of DPs[16] (50 CFR 21.41). WS has the responsibility for responding to and attempting to reduce damage caused by migratory birds when funding allows, as specified in an MOU between the USFWS and WS.

WS conducted an ESA Section 7 consultation with the USFWS to ensure that WS activities do not adversely affect T/E species (USFWS 1992). WS, LAFB and the USFWS believe the analysis contained in this EA addresses the environmental consequences of the USFWS issuing DPs and WS receiving and implementing issued permits.

4.2.6 Evaluation of Significance: Each major issue is evaluated under each alternative and the direct, indirect and cumulative impacts are analyzed. NEPA regulations describe the elements that determine whether or not an impact is *"significant."* Significance is dependent upon the context and intensity of the action. The following factors were used to evaluate the significance of the actions analyzed in this EA that relate to context and intensity (adapted from USDA 1997).

4.2.6.1 Magnitude of the Impact (size, number, or relative amount of impact) (intensity). Magnitude is defined in USDA (1997) as "*. . . a measure of the number of animals killed in relation to their abundance."* Magnitude may be determined either quantitatively or qualitatively. Quantitative determinations are based on population estimates, predetermined levels, and research data. Qualitative analysis is based on trends and modeling.

4.2.6.2 Duration and Frequency of the Action. Factors affecting bird behavior will affect the duration and frequency of conflict reduction activities at LAFB. Bird damage management at airports may be long term projects, but the frequency of individual management operations may be short, depending upon spatial and temporal factors affecting the behavior of the birds that are causing or potentially causing damage. For instance, the removal of insects may disperse foraging bird from LAFB AOA, or several birds that continue to loaf near runways may be very infrequent if non-lethal techniques prevent additional birds from habituating to the area. Projects are generally short in duration, but may happen frequently at different sites.

4.2.6.3 Likelihood of the Impact. Conflict reduction at LAFB has a low magnitude of impact as compared to natural factors. Because all wildlife populations may experience compensatory and additive mortalities, the effect of management will not result in adverse effects.

4.2.6.4 Geographic Extent. The proposed project will only occur at LAFB where damage management has been requested, agreements for such actions are in place and action is warranted, as determined by implementing the WS Decision Model (Slate et al. 1992). Actions would be limited to the LAFB AOA (*i.e.*, about 700 acres).

[16] It should be noted that blackbird, grackle, crow and magpie populations are healthy enough, and the problems they cause great enough, that the USFWS has established a "standing depredation order" (50 CFR 21.43) for use by the public. Under the "standing depredation order" (50 CFR 21.43) no federal permit is required by anyone to remove these birds if they *are committing or about to commit depredations upon ornamental or shade trees, agricultural crops, livestock, aquaculture, or wildlife, or when concentrated in such numbers and manner as to constitute a health hazard or other nuisance.*

4.3 ISSUES ANALYZED IN DETAIL

This section analyzes the environmental consequences of the issues analyzed in detail using the current program as the baseline for comparison with the other alternatives to determine if the real or potential impacts are greater, lesser or the same (Table 4-2). Three key issues of this project have been identified, and each of these issues is analyzed for each alternative. The three issues are:

- Effects on Target Wildlife, including T&E Species found in the LAFB AOA
- Efficacy to Reduce Strikes and Damage to Property
- Effects on Human Health and Safety

4.3.1 Effects on Target Wildlife, including T&E Species found in the LAFB AOA

Analysis of this issue is related primarily to those species found on the LAFB AOA (Table 1-1), or which could be dispersed during management activities. Generally, human/bird conflict reduction activities[17] are conducted on species whose populations are relatively high (*e.g.*, overabundant or *anthropogenically abundant* (Conover 2002)) and/or invasive species and only after they have caused damage or an identified damage risk.

WS conducts damage reduction activities involving bird species protected by the MBTA administered by the USFWS. These species are taken in accordance with applicable federal laws and regulations authorizing take of migratory birds, their nests and eggs within the constraints of the USFWS permitting process (50 CFR 21.41) or the National Defense Authorization Act (Federal Register 72:8931-8950, 50 CFR part 21). The USFWS, as the agency with migratory bird management responsibility, could impose restrictions on take as needed to assure cumulative take does not adversely affect the continued viability of specific populations. This should assure that cumulative impacts on species protected under the MBTA would have no significant adverse impact on the quality of the human environment and long-term viability of the population.

The target species are selected because LAFB or WS has identified those species in LAFB AOA or been killed has a result of an aircraft/bird strike and they could be taken or dispersed to protect people from injury, death or damage to property (*i.e.*, aircraft/bird strikes).

4.3.1.1 Alternative 1 – Continue the Current IWDM Human/Wildlife Conflict Reduction Program (No Action Alternative).

Generally, human/wildlife conflict reduction has been conducted on species whose population and frequency on LAFB is high. Human/wildlife conflict reduction activities at LAFB have been largely non-lethal with many more birds dispersed than killed (Table 4-1). There has been no take of non-target or T&E species by WS during strike reduction activities at LAFB. Under this alternative the number of birds and mammals taken annually would likely remain the same or not change substantially from current levels.

WS dispersed about 16,521 birds from LAFB from FY04 through FY06 using non-chemical harassment methods such as propane exploders and pyrotechnics (Table 4-1). One advantage of dispersing birds is that no cumulative impacts occur. However, there is the possibility that the birds could return to the AOA and inflict damage or move to another site and cause damage. Live capture and relocation is not normally practical for smaller birds because of: 1) the number of birds confronted, 2) potential public safety and health issues (*i.e.*, capturing birds at an airport where they were involved with aircraft hazards and relocating those birds to another area where they could return to the airport or another site and continue to be a hazard), 3) costs of relocation would increase because of the great distance it requires to relocate birds if trying to prevent them from returning to the original site, and 4) relocated birds could create the same threat in the relocation area.

[17] The analysis for magnitude of impact on populations of these species generally follows the process described in USDA (1997 Chapter 4).

The USFWS Migratory Bird Permit Office has concurred[18] that WS would have no adverse effect on federally protected migratory bird populations because of WS' human/wildlife reduction activities at LAFB (USFWS Migratory Bird Permit # MB810535-0). WS has conducted an ESA Section 7 consultation with the USFWS to ensure that WS activities do not adversely affect T/E species (USFWS 1992). WS has obtained and reviewed the list of T&E species that could be found at LAFB. LAFB and WS personnel activities at LAFB would have no effect on T&E species.

Table 4-1. Birds Removed or Dispersed for Conflict Reduction during FY04 to FY06 at LAFB.

Species	Number Removed[1]	Number Dispersed[2]
American Kestrel	32	137
American Coot	17	107
American Widgeon	11	147
Black-crowned Night Heron	0	21
Teal (all spp)	0	740
Brown-headed cowbird	0	40
Canvasback	2	12
Barn/Cliff Swallows	8	1,331
Common Nighthawk	15	166
DC Cormorant	29	412
Meadowlark (E. & W.)	514	3,102
Gadwall	0	91
Egret (cattle & greater)	4	119
Hooded merganser	0	22
Horned Lark	0	431
Killdeer	22	57
Lesser scaup	13	518
Mallard	1	114
Black Vulture	1	203
Turkey Vulture	244	2,123
Mourning Dove	11	506
Mottled Duck	0	15
N. Harrier	0	9
N. Shoveler	4	1,346
Rock Dove (pigeon)	23	5
N. Pintail	2	16
Red-tailed hawk	6	24
Ring-necked Duck	0	58
Scisor-tailed flycatcher	13	263
Geese (snow)	0	6
Swainson's Hawk	27	453
Gulls (all)	10	690
Western Kingbird	0	104
White-winged Dove	68	2,779
Wood duck	0	15
Great-tailed Grackle	113	254
Redhead Duck	0	8
Ruddy Duck	5	22
Long-billed Curlew	0	7
Common Raven	8	3
Bobwhite Quail	0	35
Great Blue Heron	0	1
Great Horned Owl	0	1
Bufflehead	1	3
Green Heron	0	4
Cooper's Hawk	0	1

[1] All lethal take was conducted by shooting.
[2] Dispersal conducted by trap and relocate, pyrotechnic use or vehicle harassment (birds flushed upon sight of the vehicle).

4.3.1.2 Alternative 2 – Enhanced Adaptive Bird Strike Risk Reduction through Carbaryl Application (Proposed Action).

Under this alternative, LAFB would implement and enhance non-lethal strike risk reduction efforts by spraying up to 700 acres of LAFB AOA with carbaryl[19], a registered pesticide[20], to reduce insect populations, the number of foraging birds on the AOA, and strike risks. Carbaryl is a carbamate, broad spectrum, insecticide that has many commercial uses for insect control on fruits, vegetables, ornamental plants, field crops, and forage crops; carbaryl is toxic to many insects[21].

Based upon the quantitative calculations of doses of carbaryl to vertebrate species, most animals have negligible risk of adverse toxicological effects. The toxic effects of carbaryl treatments is most evident by decreases in insect populations and the need for more widespread foraging by the insectivorous species. The decrease in populations of insects following carbaryl treatments is expected to be temporary with eventual recolonization of the treated areas.

The use of carbaryl, at the formulation rate of 1.25 lbs a.i./acre, has demonstrated little possibility of toxicity-caused mortality of upland birds, mammals, or reptiles (McEwen et al. 1996). These observations are consistent with the modeling results for carbaryl in APHIS (2002), which indicate negligible impact on representative mammalian, bird, and reptile species due to carbaryl treatments.

[18] Migratory Bird Permit MB #810535-0 allows WS to kill up to 600 birds annually to reduce aircraft/bird strikes and that this take will have no effect on the target species populations.

[19] Carbaryl, as proposed for use in this project, is regulated by EPA. EPA has responsibility for pesticide registration and reregistration under FIFRA, as modified by the Food Quality Protection Act of October 1996. A variety of data, including product and residue chemistry, environmental fate, and human, wildlife, and aquatic toxicity, are required for this process (see 40 CFR 158).

[20] All treatments using carbaryl will be conducted in strict adherence with the EPA-approved label directions.

[21] Carbaryl applied to turfgrass at labeled rates decreased earthworms (*Oligochaeta: lumbricidae*) by 60 to 99% (Potter et al. 1990). Spiders are not severely affected in carbaryl-treated fields, and recovery occurs within 3 weeks after spraying (Shepard and Sterling 1972, Barrett 1968). Carbaryl is severely toxic to predatory mites, but less toxic to phytophagous mites (Bartlett 1968).

Carbaryl is only slightly toxic to birds, reptiles and amphibians, and of low phytotoxicity to most plants. Carbaryl can be used effectively both early and late in the season over a broad range of climatic conditions to treat insects. Carbaryl, however, is short-lived in the environment with a half-life in soil ranging from 7 to 28 days; carbaryl has a half-life of 7 to 14 days in sandy loam soil and 14 to 28 days in clay loam soil with degradation mostly due to sunlight and bacterial action. Degradation of carbaryl in vegetation occurs by hydrolysis inside the plants and has a short residual life of less than 2 weeks. The main metabolites and degradation products of carbaryl are considerably less toxic than carbaryl.

The mode of action for carbaryl occurs primarily through acetylcholinesterase (AChE) inhibition (Smith 1987, Klaassen et al. 1986), however, this inhibition is reversible if exposure ceases. Carbaryl is of moderate acute oral toxicity to mammals. The oral LD_{50} of carbaryl ranges from 250 mg/kg to 850 mg/kg in rats, and from 100 mg/kg to 650 mg/kg in mice. The acute dermal LD_{50} was reported to exceed 4,000 mg/kg for rats and exceeded 5,000 mg/kg for rabbits (EPA, ECAO 1984). The acute inhalation LD_{50} is 721 mg/kg (Hazardous Substances Database 1987) and, based on a 1-year dog feeding study, it has a systemic no-observed-effect level (NOEL) at 1.4 mg/kg and the no-observed-adverse-effect level (NOAEL) was 3.83 mg/kg based upon significant decrease in plasma and brain cholinesterase activity (EPA, OPPTS 1994).

The acute oral LD_{50} of carbaryl to birds ranges from 707 mg/kg to 3,000 mg/kg (Hudson et al. 1984). A number of studies have reported no effects on bird populations in areas treated with carbaryl (Richmond et al. 1979, McEwen et al. 1962, Buckner et al. 1973). Some applications of carbaryl were found to cause depressed AChE levels (Zinkl et al. 1977, Gramlich 1979). However, in samples collected over a period of several years during multiple carbaryl treatments, not a single bird or mammal was found to have more than a 40% AChE inhibition, and only a few individuals had an AChE inhibition as high as 20% (McEwen et al. 1996). Field studies in North Dakota were conducted to determine the effects of carbaryl treatment on killdeer (*Charadrius vociferus)* populations. At treatment rates of 0.4 and 0.5 lb a.i./acre, no toxic signs and no mortality were observed in the killdeer population. Effects on foraging and diet of the killdeer were examined by both direct observation and analysis of stomach contents (Fair et al. 1995a). The insect capture rate by foraging killdeer increased during the 2-day period after treatment when affected insects were easily obtainable[22] (Fair et al. 1995b). There were no other differences or changes in food habits observed. A quantitative risk assessment in APHIS (2002) established that the estimated carbaryl dose that rangeland birds would accumulate, by both direct exposure and indirectly through diet, in carbaryl treatment areas is well below a toxic level. The effects of carbaryl on vesper sparrow (*Pooecetes gramineus*) nestling growth and survival were also investigated in North Dakota (McEwen et al. 1996). Vesper sparrow survival, growth, and fledgling rates were not affected by carbaryl treatments around the nesting areas, and there was no difference in any of the productivity parameters between vesper sparrow nests on treated and untreated sites (Adams et al. 1994). However, in some areas the reduced number of insects necessary for bird survival and development may have resulted in birds having leave treatment areas to more effectively forage, the objective of this project.

Studies of carbaryl neurotoxicity were conducted with hens given subcutaneous injections (Carpenter et al. 1961, Gaines 1969). Based on the evaluations of these studies, EPA, OPTS (1980) concluded that carbaryl does not pose any neurotoxic human health hazard. At doses below 0.01 mg/kg/day, no neurological or other adverse systemic effects are anticipated. In addition, current information suggests that immunotoxic effects from carbaryl could only occur at doses in excess of those resulting in neurological or reproductive effects, so immunotoxic responses are not anticipated to be critical effects from project use of carbaryl.

Carbaryl is moderately toxic to most fish (*e.g.*, rainbow trout (LC_{50} of 1.3 mg/L), and bluegill (10 mg/L) and highly toxic to aquatic invertebrates[23]. Species of catfish and minnow are generally 10 times more

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[22] Proposed LAFB treatment would occur before migrating bird arrive at LAFB and therefore vulnerable insect will not be available for foraging birds.

[23] Aquatic organisms would be protected from carbaryl exposure by protective operational measures and adherence to insecticide labels. These measures are intended to prevent carbaryl from entering water bodies. The site-specific protective measures would include: 1) prohibiting direct application to water bodies, 2) restrictions to application when rain is forecast, and 3) measures to reduce pesticide drift.

tolerant than salmonids. Fish exposed to carbaryl showed no inhibition of AChE (Beyers and McEwen 1996). Beyers et al. (1995) and Beyers and McEwen (1996) reported that carbaryl posed no greater hazard to T&E fish than to fish not listed as T&E species. Data about effects of carbaryl to amphibians and reptiles is limited to toxicologic information about the bullfrog (*Rana* spp.). The acute oral LD_{50} of carbaryl to bullfrogs is greater than 4,000 mg/kg (Hudson et al. 1984); this indicates that carbaryl is only slightly toxic to most of these species. Studies by Beyers et al. (1995) were conducted in the Little Missouri River during a drought year when insecticide exposure to aquatic organisms was higher because the insecticides were less diluted by the river water. Of the many effects on aquatic organisms, the only negative impact detected was an increase in invertebrate drift during the first 3 hours after carbaryl application. Sampling later that same day showed that the increase in invertebrate drift was transient and undetectable after 3 hours. Further, it is not expected that carbaryl applications will have detectable runoff or any leaching to groundwater; its half-life in freshwater ranges from 1 to 6 days. The overall conclusion was that the strike risk reduction program will have no biologically significant effect on aquatic resources.

EPA has determined qualitatively that carbaryl poses no teratogenic or reproductive risk to humans; none of the three published reviews (Baron 1991; Cranmer, 1986; Mount and Oehme 1981) suggest that carbaryl is a potential human teratogen. A three-generation reproduction study of rats found a NOEL of 200 mg/kg/day (highest dose tested) when carbaryl was administered in their diet (Weil et al. 1973). A teratologic study of beagle dogs determined a NOEL of 3.125 mg/kg/day and the lowest effect level (LEL) of 6.25 mg/kg/day. A set of studies considered dietary and gavage exposure of mice and gavage exposure of rabbits. The teratogenic NOEL for mice was 1,166 mg/kg/day for dietary exposure and 150 mg/kg/day for gavage (highest doses tested) (Murray et al. 1979). The maternal NOEL for each exposure to mice, based upon decreased weight gain and cholinesterase inhibition, was determined to be less than 1,166 mg/kg/day for dietary exposure and less than 150 mg/kg for gavage. The teratogenic and maternal NOEL of 150 mg/kg/day was determined for rabbits. Based upon EPA's laboratory studies (EPA, OPP 1984), carbaryl does not constitute a potential human teratogen or reproductive hazard under proper usage. A dominant lethal rat mutation assay was negative at 200 mg/kg (Epstein et al. 1972). The reproductive effects assessment group of EPA concluded that data from mutagenicity studies can be classified as a weak mutagen (EPA, OPP 1984). Carbaryl does not pose any mutagenic risk at program application rates.

The potential of carbaryl for carcinogenicity is less than one in a million and much higher applications of carbaryl than proposed would be required to pose unacceptable risks of carcinogenicity (EPA 1993).

Most potential community effects in terrestrial habitats appear to relate to the reduction in insect populations. Reduction of insect populations on sites treated with carbaryl in New Jersey were correlated to reduced bird populations (Moulding 1972). Removal of insects has been suggested as cause for bird declines (Doane and Schaefer 1971), the objective of the project on the AOA.

At the proposed application rate, there is very little possibility of toxicity-caused mortality of upland birds, mammals, or reptiles, and none has been observed from other studies (McEwen et al. 1996). The metabolites of carbaryl have lower toxicity to humans than carbaryl itself. The breakdown of this substance is strongly dependent on acidity and temperature. In general, due to its rapid metabolism and rapid degradation, carbaryl does not pose a significant bioaccumulation risk. Further, the LAFB applications will occur far from any ponds or other areas where fish and aquatic invertebrate are present.

Under this alternative, the take of target animals would probably be less than that of the proposed action. However, non-target take would not differ substantially from the current program because the current program has not taken any non-target animals. On the other hand, airports whose wildlife damage problems were not effectively resolved by non-lethal control methods and recommendations would likely resort to other means of lethal control such as use of shooting.

4.3.1.3 Alternative 3 – Additional Operational Lethal and Nonlethal Bird Strike Risk Reduction

Under this alternative, WS would likely have a greater impact on the target species population at LAFB than Alternative 1 and 2. WS would increase the amount of operational assistance provided to LAFB, probably to the extent of one additional person year. An IWDM approach would be implemented to reduce wildlife strike risks in all situations, but lethal conflict reduction would occur more often. WS would continue to recommend or use non-lethal management activities; however it is likely that a greater number of birds, and possible mammals, would be removed lethally to attempt to achieve the same strike risk reduction as the proposed action. However based upon the information described in section 4.2.1.1 and 4.2.1.2, it is unlikely that target species populations would be adversely affected by implementation of this alternative.

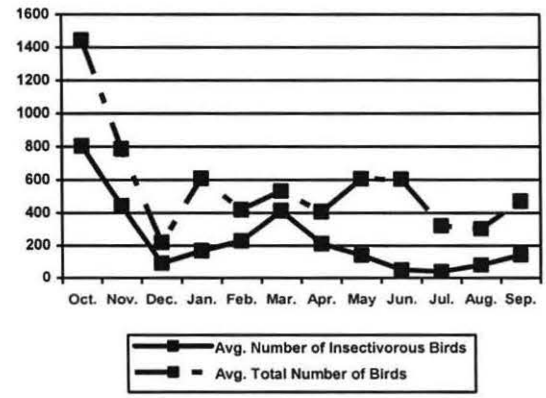
4.3.2 Efficacy to Reduce Strikes and Damage to Property

4.3.2.1 Alternative 1 – Continue the Current IWDM Human/Wildlife Conflict Reduction Program (No Action Alternative).

The current program serves as a viable alternative and is judged to be effective at reducing bird strike risk. Since the inception of the current program in 2003 there had been an initial increase in bird strikes followed by a decline in strike rates. The initial increase is associated with increased reporting and may not demonstrate an actual increase in strikes. The increased reporting after the initiation of a BASH program is a very common phenomenon. Declines in strike rates have been observed since 2005 and likely represent real declines, even through a period of increased awareness and reporting.

Bird strikes at LAFB are associated with bird abundance. Figure 4-1 shows the average monthly bird observations and insectivorous bird observations. These data support the observed seasonal increase in birds associated with migration. Peaks in abundance occur in March and October. These seasonal peaks also represent peaks in bird strikes, hours required to mitigate bird hazards and lethal take.

Figure 4-1. Average Total Bird and Insectivorous Bird Abundance - LAFB FY 2005 – 2007.



Continuation of the current program will not likely decrease strike risk additionally. As the baseline for analysis, we would assume no change from implementing this alternative.

4.3.2.2 Alternative 2 – Enhanced Adaptive Bird Strike Risk Reduction through Carbaryl Application (Proposed Action Alternative).

Insecticide treatments that suppress insect populations would not result in any permanent changes in the ecological relationships that exist between insects and the ecosystem. However, when treatments are applied at the correct time period (*i.e.*, during target bird migration), insect populations temporarily decease and the risk of bird strikes also decreases; the effects of carbaryl treatments are most evident by decreases in insect populations. Ground applications of carbaryl sprays were the most efficacious treatments with immediate reductions in the total number of insects ranging from 84 to 99%. This is followed by the need for insectivorous birds to forage away from treated areas; this will result in birds having to leave treatment areas to more effectively forage, the objective of this project. During the peaks of migratory abundance, insectivorous birds represent 55% and 77% of the fall and spring LAFB observations respectively. The decrease in bird densities is expected to temporarily reduce strike risks as birds move away from the LAFB AOA, thereby increasing the effectiveness of the program to reduce strike risks.

4.3.2.3 Alternative 3 – Additional Operational Lethal and Nonlethal Bird Strike Risk Reduction.

Alternative 3 would enhance the current program with additional nonlethal and lethal methods focused directly at the birds themselves. Additional personnel would be available for bird strike reduction through a combination of lethal and nonlethal tools (Appendix B). Additional tools may also be implemented.

Alternative 3 would be more effective than Alternative 1 as additional personnel would be able to cover more of the AOA and additional lethal take would decrease the strike risk. However, this alternative would require birds to be within the AOA before they were removed and the risks would be only partially reduced. Alternative 3 would not be as effective as Alternative 2.

4.3.3 Effects on Human Health and Safety

4.3.3.1 Alternative 1 – Continue the Current IWDM Human/Wildlife Conflict Reduction Program (No Action Alternative).

Airport personnel are concerned with potential injury and loss of human life as a result of aircraft/bird strikes. Non-chemical conflict reduction methods that raise safety levels include shooting with firearms and harassment with pyrotechnics. Firearms are only used by WS personnel who are experienced in handling and using them. WS personnel receive safety training on a periodic basis to keep them aware of safety concerns. Shooting with shotguns, air rifles, and other firearms is selectively used for the target species and helps to reinforce bird scaring and harassment efforts. Firearm use is very sensitive and a concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 2 years (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are also required to certify that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence. A formal risk assessment of WS' operational management methods found that risks to human safety were low (USDA 1997, Appendix P). Therefore, no adverse impacts on human safety from WS' use of these methods are expected.

4.3.3.2 Alternative 2 – Enhanced Adaptive Bird Strike Risk Reduction through Carbaryl Application (Proposed Action Alternative).

Following labeling requirements and use restrictions are built-in SOPs that would assure that use of carbaryl would avoid adverse effects on human health. Immunotoxic effects of carbaryl are generally expected at concentrations much higher than those from the proposed insect applications. Individuals with allergic or hypersensitive reactions to the insecticide or other chemicals in the formulated product could possibly be affected; however the LAFB AOA is a restricted area with no public access. In addition, once the insecticide has time to dry on the vegetation the risk of adverse reaction is very small. The only documented fatality from carbaryl was through intentional ingestion.

Three types of exposure scenarios have been considered: routine, extreme, and accidental. For routine exposures, assumptions were that the recommended application rates are used, that recommended safety precautions are followed, and that the estimated parameters, such as food or water consumption rates and skin surface area, are based on the most likely activities and circumstances. For extreme exposures, assumptions were that recommended procedures and precautions are not followed and that exposure was based on different activities and circumstances that increased the estimate of exposure. For accidental exposures, the assumption was that equipment failure or gross human error occurred. The decision to use a particular scenario was based on its applicability to the insecticide being assessed and the need to encompass uncertainties in the exposure.

A Human Health Risk Assessment (EPA, OHEA, ORD 1988) considered potential exposed or absorbed doses for individuals of different age groups, adults and young children who may, under certain circumstances, be more vulnerable. Values such as body weights and food consumption rates were taken from standard sources. Included in this risk assessment are the potential effects on program workers, the general public, and groups of people who may be at special or increased risk. The potential high risk group includes those who are sensitive to specific chemicals, those with multiple chemical sensitivities, those whose health status may make them more susceptible to effects, and those whose lifestyles may make them more prone to come into contact with the carbaryl in the treatment area.

Potential exposures to the general public from conventional applications at LAFB are nonexistent to very infrequent and of a low magnitude. The exposure risk to the public poses no risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity. Potential worker exposures are higher and have the potential for adverse effects if proper safety procedures, including required protective gear, are not used. Workers who handle insecticides with proper care can reduce their exposure substantially. Conversely, poor work habits can increase exposure substantially. At the lower and mid-ranges of exposure, it is unlikely that there would be overt signs of toxicity. Carbaryl has been used for many years, and reports of occupational poisoning, either published or anecdotal, have not been encountered; with good personal work practices, carbaryl can be handled safely.

Under most exposure scenarios, members of the general public are not at any risk from carbaryl use at LAFB. However, any exposure to carbaryl would diminish rapidly as the carbaryl degrades and disperses. The rapid degradation and infrequent applications of the proposed action would not be routinely (or chronically) expected to result in excessive exposures. The only exposures from program applications would be acute and not expected to cause adverse reproductive effects with the short duration of potential exposure. Carbaryl has been used routinely in other pest management programs with no reports of adverse health effects. Therefore, routine safety precautions are anticipated to continue to provide adequate protection of worker health.
In addition, compliance with all product label requirements for human health and safety including the Worker Protection Standard (40 CFR § 170) will be followed. No reproductive or fetal effects have been observed with carbaryl during a long-term study of rats fed high doses and numerous studies indicate that carbaryl poses only a slight mutagenic risk during long-term feeding studies.

Carbaryl is of moderate acute oral toxicity to humans. EPA has classified carbaryl as a "possible human carcinogen" based on an increased incidence of vascular tumors in a chronic study of male mice exposed at 46 mg/kg/day (1000 parts per million (ppm)) (EPA 1993). However, the evidence suggests that carbaryl is unlikely to be mutagenic to humans. Technical-grade carbaryl has not caused tumors in long-term and lifetime studies of mice and rats. Rats were administered high daily doses of the pesticide for 2 years, and mice for 18 months, with no signs of carcinogenicity. Thus, the evidence indicates that carbaryl is unlikely to be carcinogenic to humans.

Ingestion of carbaryl affects the lungs, kidneys, and liver; inhalation will also affect the lungs. Nerve damage can occur after administration of high doses for 50 days in rats and pigs. Several studies indicate that carbaryl can affect the immune system in animals and insects. However male volunteers who consumed low doses of carbaryl for 6 weeks did not show symptoms, but tests indicate slight changes in their body chemistry. A 2-year study with rats revealed no effects at or below a dose of 10 mg/kg/day.

Most mammals, including humans, readily break down carbaryl and rapidly excrete it in the urine and feces. Workers occupationally exposed by inhalation to carbaryl dust excreted 74% of the inhaled dose in the urine in the form of a breakdown product. The metabolism of up to 85% of carbaryl occurs within 24 hours after administration (Dorough, 1970). Watersoluble metabolites taken up by mammals are also quickly eliminated, mainly in the urine (Casida and Lykken, 1969). Carbaryl is not subject to significant bioaccumulation due to its low water solubility and low octanol-water partition coefficient (Dobroski et al. 1985). Uptake of carbaryl in fish has been detected with 95% excreted within 8 hours (Tompkins, 1966).

For the general public, repeated exposure to carbaryl from LAFB would be impossible. Applications to reduce strike risks are unlikely to be repeated within a given season, so exposures would be very and LAFB is a restricted area. The treatment areas are on the LAFB AOA where children or any other public is not allowed. Therefore, it is not expected that carbaryl to result in exposures to children, or the public and children or the public would not have any adverse effects from these actions.

Degradation of carbaryl in soil results primarily from the metabolic activity of microorganisms (Heywood 1975), but hydrolysis and photolysis also occur. Biodegradation of carbaryl is a principle breakdown mechanism and as much as 80% has been shown to mineralize (degrade) within 4 weeks (Howard 1991). Little transport of carbaryl through runoff or leaching to groundwater is expected due to the low water solubility, moderate sorption, and rapid degradation in soils. There are no reports of carbaryl detection in groundwater and less than 1% of carbaryl applied to a sloping plot was detected in runoff (Caro et al. 1974).

Degradation of carbaryl is rapid in both freshwater and saltwater. Carbaryl applied over open freshwater was found to degrade completely in 1 to 2 days (CDFG 1963, Lichtenstein et al. 1966). All carbaryl degraded from seawater in 17 days at 20° C (Karinen et al. 1967). Kinetic studies determined the half-life for hydrolysis in neutral to alkaline freshwater to be 1.3 to 1.5 days (Wolfe et al. 1978, Aly and El-Dib 1971). The photolysis half-life in water was determined to be 6.6 days (Wolfe et al. 1978). Carbaryl concentrations following a 1.5-inch rainstorm are projected to have less than 5 parts per billion (ppb) in streams and less than 13 ppb in ponds based upon Groundwater Loading Effects of Agricultural Management modeling (USDA, APHIS 1996).

Carbaryl has a short residual life on plant surfaces; insecticidal properties are retained for 3 to 10 days (EPA, OPTS 1985). The major metabolite is 1-naphthol. Although carbaryl is a polar compound, bioconcentration in plants is not of concern due to limited plant uptake relating to the low water solubility and rapid degradation (Nash 1974). Exposure of vegetation to carbaryl at the proposed program application rates is low and would not be expected to result in any phytotoxic effects. Indirect effects include the beneficial impact of reducing the number of insects found on the AOA and could create an increase strike risks for pilots and crews at LAFB.

If SPOS and the daily exposure level does not exceed the daily level that would be tolerable for a lifetime, exposure for shorter periods will not present a hazard. It is expected that the program will seldom, if ever, need to retreat any sites within a given season. Based on the above analysis, there are no adverse impacts on human safety from implementation of this Alternative.

4.3.3.3 Alternative 3 – Additional Operational Lethal and Nonlethal Bird Strike Risk Reduction

Under this alternative, aircraft/birds strikes could be further reduced from Alternative 1, but probably not to the level of Alternative 2. Increase presence of personnel patrolling the AOA would be required to disperse or remove birds that are found in the AOA. This would lead to greater use of firearms and pyrotechnics and personnel actively interacting with aircraft crews, tower personnel and others as necessary to insure ground personnel do not interfere with flight operations. Based on the above analysis, there would be no adverse impacts on human safety from implementation of this Alternative when SOPs and other safety procedures are followed.

4.4 CUMULATIVE IMPACTS

This EA constitutes an environmental evaluation LAFB strike risk reduction program that involves the application of carbaryl during peak bird strike periods. It is the effects of the use of carbaryl that will be added to the past, present, and future actions that have or will occur in the action area when considering cumulative impacts.

No significant cumulative environmental impacts are expected from any of the three alternatives analyzed in detail. Under Alternative 1 and 3, the lethal removal of wildlife would not have a significant impact on overall wild bird and mammal populations at LAFB or the surrounding area. No risk to public safety is expected in any of the Alternatives, since only trained and experienced wildlife biologists and certified pesticide applicator following EPA labels would conduct activities. Although some persons will likely be opposed to LAFB strike reduction activities to protect human health and safety and property, the analysis in this EA indicates that the proposed and current programs will not result in significant direct, indirect or cumulative adverse impacts on the quality of the human environment.

Monitoring is part of the proposed and current program and involves the evaluation of various aspects of the strike reduction risks programs. There are three aspects of the programs that may be monitored: 1) the efficacy of the treatment. APHIS will determine how effective the application of an insecticide has been in suppressing insect populations within a treatment area, 2) is monitoring safety. This includes ensuring the safety of the program personnel through use of personal protective equipment, such as long-sleeved or long-legged clothing and respirators to prevent overexposure, and 3) environmental monitoring (APHIS Directive 5640.1). This includes such things as checking to make sure that carbaryl is applied in accordance with the label. Under NEPA, monitoring would be conducted to ensure compliance with mitigation adopted as part of the decision to conduct a treatment program.

Table 4-2. Summarizes the expected impact of each alternative on each of the issues.

Issues/Methods	**Alternative 1 – Continue the Current IWDM Human/Wildlife Conflict Reduction Program (No Action Alternative).**	**Alternative 2 – Enhanced Adaptive Bird Strike Risk Reduction through Carbaryl Application (Proposed Action Alternative).**	**Alternative 3- Additional Operational Lethal and Nonlethal Bird Strike Risk Reduction**
Effects on Target Wildlife, including T&E Species found in the LAFB AOA	Local populations in areas with damage or threat of damage would be slightly reduced. No effects on state populations.	No effect by WS. Results would be less than the proposed action.	Local populations in areas with damage or threat of damage could be increasingly reduced and sustained at a lower level. No effects on state populations.
Efficacy to Reduce the Risk of Strikes	No probable effect from the current level.	Reduced strike risk from the current level. The proposed action has the greatest potential of successfully reducing this risk.	Reduced strike risk from the current level, but not to the level of Alternative 2
Effects on Human Health and Safety	No effect, but slightly increase strike risk when compared to Alternative 2	Alternative 2 has the greatest potential to reduce strike risks and protect human health and safety.	Greater potential to reduce strike risks than Alternative 1, but less than Alternative 2.

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Appendix A

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Appendix B

METHODS AVAILABLE FOR USE TO REDUCE WILDLIFE STRIKES AT LAFB

NON-LETHAL METHODS - NON-CHEMICAL

LAFB Practices. These consist primarily of non-lethal preventive methods such as cultural methods and habitat modification. Cultural methods and other management techniques are implemented by LAFB and may be supplemented by WS activities at LAFB and with adjacent property owners. Property owner practices recommended by WS include:

Cultural methods. These generally involve modifications to the level of care or attention given to the habitat which may vary depending on various factors, including age, size, and location of the resource.

Animal behavior modification. This refers to tactics that alter the behavior of wildlife and reduce damages. Animal behavior modification may use scare tactics or exclusion to deter or repel birds that cause loss or damage (Twedt and Glahn 1982). Some but not all devices used to accomplish this are:

X Bird-proof exclusions
X Electronic guards
X Propane exploders
X Pyrotechnics
X Distress calls and sound producing devices
X Chemical frightening agents
X Repellents
X Visual scare devices

These techniques are generally only practical for small areas. Scaring devices such as distress calls, helium filled eye spot balloons, raptor effigies and silhouettes, mirrors, and moving disks can be effective but usually for only a short time before birds become accustomed and learn to ignore them (Schmidt and Johnson 1984, Bomford 1990, Rossbach 1975, Graves and Andelt 1987, Mott and Boyd 1985, Shirota et al. 1983, Conover 1982, Arhart 1972). Mylar tape has produced mixed results in its effectiveness to frighten birds (Dolbeer et al. 1986, Tobin et al. 1988).

Auditory scaring devices such as propane exploders, pyrotechnics, electronic guards, scare crows, and audio distress/predator vocalizations, are often not practical under large feedlot situations because of the disturbance to livestock, although livestock would habituate to the noise. Birds, too, quickly learn to ignore scaring devices if the birds' fear of the methods is not reinforced with shooting or other tactics.

Bird proof exclusions can be effective but are often cost-prohibitive, particularly because of the aerial mobility of birds which require overhead barriers as well as conventional netting. Exclusion adequate to stop bird movements can also restrict movements of people, equipment and other wildlife (Fuller-Perrine and Tobin 1993). Heavy plastic strips hung vertically in open doorways have been successful in some situations in excluding birds (Johnson and Glahn 1994). Plastic strips, however, can prevent filling of the feed troughs at livestock feeding facilities or can be covered up when the feed is poured into the trough by the feed truck. They are not practical for open-air feedlot operations that are not housed in buildings.

Relocation of damaging birds to other areas following live capture generally would not be effective nor cost-effective. Since starlings, blackbirds, pigeons, and most other damaging species are common and numerous throughout Texas, they are rarely if ever relocated because habitats in other areas are generally already occupied. Relocation of wildlife often involves stress to the relocated animal, poor survival rates, and difficulties in adapting to new locations or habitats.

However, there are exceptions to the rule for relocating birds. Relocation of damaging birds might be a viable solution and acceptable to the public when the birds were considered to have high value such as most species of raptors, migratory waterfowl or T&E species. In these cases, WS would consult with the USFWS and TPWD to coordinate capture, transportation, and selection of suitable relocation sites.

Nest destruction is the removal of nesting materials during the construction phase of the nesting cycle. Nest destruction would only be applied when dealing with a single or very few birds. This method is used to discourage birds from constructing nests in areas which may create nuisances for home and business owners. Heusmann and Bellville (1978) reported that nest removal was an effective but time-consuming method because problem bird species are highly mobile and can easily return to damage sites from long distances, or because of high populations. This method poses no imminent danger to pets or the public.

Live traps include:

Clover, funnel, and common pigeon traps are enclosure traps made of nylon netting or hardware cloth and come in many different sizes and designs, depending on the species of birds being captured. The entrance of the traps also vary greatly from swinging-door, one-way door, funnel entrance, to tip-top sliding doors. Traps are baited with grains or other food material which attract the target birds. WS▴ standard procedure when conducting pigeon trapping operations is to ensure that an adequate supply of food and water is in the trap to sustain captured birds for several days. Active traps are checked daily, every other day, or as appropriate, to replenish bait and water and to remove captured birds.

Decoy traps are used by WS for preventive and corrective damage management. Decoy traps are similar in design to the Australian Crow Trap as reported by Johnson and Glahn (1994) and McCracken (1972). Live decoy birds of the same species that are being targeted are usually placed in the trap with sufficient food and water to assure their survival. Perches are configured in the trap to allow birds to roost above the ground and in a more natural position. Feeding behavior and calls of the decoy birds attract other birds which enter and become trapped themselves. Active decoy traps are monitored daily, every other day, or as appropriate, to remove and euthanize excess birds and to replenish bait and water. Decoy traps and other cage/live traps, as applied and used by WS, pose no danger to pets or the public and if a pet is accidentally captured in such traps, it can be released unharmed.

Nest box traps are used by WS for corrective damage management and are effective in capturing local breeding and post breeding starlings and other targeted secondary cavity nesting birds (DeHaven and Guarino 1969, Knittle and Guarino 1976).

Mist nets are more commonly used for capturing small-sized birds such as house sparrows, finches, etc. but can be used to capture larger birds such as ducks and ring-neck pheasants. It was introduced in to the United States in the 1950's from Asia and the Mediterranean where it was used to capture birds for the market (Day et al. 1980). The mist net is a fine black silk or nylon net usually 3 to 10 feet wide and 25 to 35 feet long. Net mesh size determines which birds can be caught and overlapping ▪pockets• in the net cause birds to entangle themselves when they fly into the net.

Cannon nets are normally used for larger birds such as pigeons, feral ducks, and waterfowl and use mortar projectiles to propel a net up and over birds which have been baited to a particular site. This type of net is especially effective for waterfowl that are flightless due to molting and other birds which are typically shy to other types of capture.

Bal-chatri traps are small traps used for capturing birds of prey such as hawks and eagles. Live bait such as pigeons, starlings, rodents, etc. are used to lure raptors into landing on the trap (Hygnstrom and Craven 1994) where nylon nooses entangle their feet and hold the bird. The trap is made of chicken wire or other wire mesh material and formed into a Quonset-hut shape cage which holds the live bait. The outside top and sides are covered with many nooses consisting of strong monofilament line or stiff nylon string.

Environmental/Habitat/Behavior modification is an integral part of wildlife management. The type, quality, and quantity of habitat are directly related to the wildlife that are produced. Therefore, habitat can be managed to not produce or attract certain bird species or to repel certain birds. Most habitat management revolves around airports and bird aircraft strike problems and blackbird and starling winter roosts. Habitat management around airports is aimed at eliminating bird nesting, roosting, loafing, or feeding sites. Generally, many bird problems on airport properties can be minimized through management of vegetation and water from runway areas. Habitat management is often necessary to minimize damage caused by blackbirds and starlings that form large roosts during late autumn and winter. Bird activity can be greatly reduced at roost sites by removing all the trees or selectively thinning the stand. Roosts often will re-form at traditional sites, and substantial habitat alteration is the only way to permanently stop such activity (USDA 1997).

NON-LETHAL METHODS - CHEMICAL

Chemical methods are not currently used at LAFB. However, a suite of chemicals are available for bird damage management. These include:

Methyl anthranilate (artificial grape flavoring used in foods and soft drinks for human consumption) could be used or recommended by WS as a bird repellent. Methyl anthranilate is currently registered as a repellent to protect turf from bird grazing and as a spray for airport runways to reduce bird activity/risk on or near airports. It is also being investigated as a livestock feed additive to reduce or prevent feed consumption by birds. Such chemicals undergo rigorous testing and research to prove safety, effectiveness, and low environmental risks before they would be registered by EPA or the Food and Drug Administration (FDA).

Avitrol is a chemical frightening agent (repellent) that is effective in a single dose when mixed with untreated baits, normally in a 1:9 ratio. Avitrol, however, is not completely non-lethal in that a small portion of the birds could be killed (Johnson and Glahn 1994). Prebaiting is usually necessary to achieve effective bait acceptance by the target species. Avitrol treated bait is placed in an area where the targeted birds are feeding and usually a few birds will consume a treated bait and become affected by the chemical. The affected birds then broadcast distress vocalizations and display abnormal flying behavior, thereby, frightening the remaining flock away. Avitrol is a restricted use pesticide that can only be sold to certified applicators and is available in several bait formulations where only a small portion of the individual grains carry the chemical. It can be used during anytime of the year, but is used most often during winter and spring. Any granivorous bird associated with the target species could be affected by Avitrol. Avitrol is water soluble, but laboratory studies demonstrated that Avitrol is strongly absorbed onto soil colloids and has moderately low mobility. Biodegradation is expected to be slow in soil and water, with a half-life ranging from three to 22 months. However, Avitrol may form covalent bonds with humic materials, which may serve to reduce its bioavailability in aqueous media, is non-accumulative in tissues and rapidly metabolized by many species (Schafer 1991). Avitrol is acutely toxic to avian and mammalian species, however, blackbirds are more sensitive to the chemical and there is little evidence of chronic toxicity. Laboratory studies with predator and scavenger species have shown minimal potential for secondary poisoning, and during field use only magpies and crows appear to have been affected (Schafer 1991). However, a laboratory study by Schafer et al. (1974) showed that magpies exposed to two to 3.2 times the published Lethal Dose (LD_{50}) in contaminated prey for 20 days were not adversely affected and three American kestrels were fed contaminated blackbirds for seven to 45 days were not adversely affected. Therefore, no probable risk is expected, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound. No probable risk is expected for pets and the public, based on low concentrations and low hazards quotient value for non-target indicator species tested on this compound.

Alpha-chloralose is a central nervous system depressant used as an immobilizing agent to capture and remove nuisance waterfowl and other birds. It is labor intensive and in some cases, may not be cost effective (Wright 1973, Feare et al. 1981), but is typically used in recreational and residential areas, such as swimming pools, shoreline residential areas, golf courses, or resorts. Alpha-chloralose is typically delivered as a well contained bait in small quantities with minimal hazards to pets and humans; single bread or corn baits are fed directly to the target birds. WS personnel are present at the site of application during baiting to retrieve the immobilized birds. Unconsumed baits are removed from the site following each treatment. Alpha-chloralose was eliminated from more detailed analysis in USDA (1997) based on critical element screening, therefore, environmental fate properties of this compound were not rigorously assessed. However, the solubility and mobility are believed to be moderate and environmental persistence is believed to be low. Bioaccumulation in plants and animal tissue is believed to be low. Alpha-chloralose is used in other countries as an avian and mammalian toxicant. The compound is slowly metabolized, with recovery occurring a few hours after administration (Schafer 1991). The dose used for immobilization is designed to be about two to 30 times lower than the LD_{50}. Mammalian data indicate higher LD_{50}

values than birds. Toxicity to aquatic organisms is unknown (Wornecki et al. 1990) but the compound is not generally soluble in water and therefore should remain unavailable to aquatic organisms. Factors supporting the determination of this low potential included the lack of exposure to pets, non-target species and the public, and the low toxicity of the active ingredient. Other supporting rationale for this determination included relatively low total annual use and a limited number of potential exposure pathways. The agent is currently approved for use by WS as an Investigative New Animal Drug by the FDA rather than a pesticide.

Carbaryl is a widely-used carbamate general use insecticide with anticholinesterase activity. It however, has the important characteristic of rapid degradation and reversibility. Carbaryl is an odourless, white, crystalline solid, with a low volatility and practically insoluble in water, stable to light and heat up to 70 °C, and easily hydrolysed by alkaline materials; it is non-corrosive.

Carbaryl is used to kill a range of chewing and sucking insects around the world on more than 120 agricultural crops and also for public health and veterinary practice; carbaryl is used against ectoparasites of humans and animals, including head lice on children (Tomlin 1994, Whitehead 1995). It is also available for household lawn and garden use to control pest invertebrates.

The health hazard of carbaryl for human beings is judged to be low because of its low vapor pressure, rapid degradation, the rapid spontaneous recovery. Because of its rapid metabolism and excretion, it does not accumulate in tissues and generally excreted entirely within 24 to 96 hours. It can, however, if handled incorrectly and carelessly be hazardous to humans. Therefore, carbaryl will be handled and use according to label guidance under the proposed action. Signs and symptoms of overexposure may include headache, tiredness, pinpoint pupils, blurred vision, lacrimation, excessive nasal discharge or salivation, sweating, dizziness, stomach pain, nausea, vomiting, diarrhoea, tremor, difficulties in breathing, cyanosis, convulsions, and unconsciousness. Symptoms appear immediately or within 12 h of exposure but recovery is very rapid.

With normal use, carbaryl should not cause environmental concern. It is adsorbed on soil particles to a great extent and does not readily leach into groundwater. It is rapidly degraded in the environment and therefore is not persistent. Use of carbaryl should not result in harmful short-term effects on the ecosystem and at worst, carbaryl has only limited persistence in the environment. In water, it is easily degraded under most conditions; the half-life ranges from a few minutes to several weeks. In soil, the half-life ranges from a few days to several weeks.

LETHAL METHODS - MECHANICAL

Egg addling/destruction is the practice of destroying the embryo prior to hatching. Egg addling is conducted by vigorously shaking an egg numerous times which causes detachment of the embryo from the egg sac. Egg destruction can be accomplished in several different ways, but the most commonly used methods are manually gathering eggs and breaking them, or by oiling or spraying the eggs with a liquid which covers the entire egg and prevents the egg from obtaining oxygen. Although WS does not commonly use egg addling or destruction, it is a valuable damage management tool and has shown to be effective.

Shooting is more effective as a dispersal technique than as a way to reduce bird densities when large number of birds are present. Normally shooting is conducted with shotguns or air rifles. Shooting is a very individual specific method and is normally used to remove a single offending bird. However, at times, a few birds could be shot from a flock to make the remainder of the birds more wary and to help reinforce non-lethal methods. Shooting can be relatively expensive because of the staff hours sometimes required (USDA 1997). It is selective for target species and may be used in conjunction with the use of spotlights, decoys, and calling. Shooting with shotguns, air rifles, or rim and center fire rifles is sometimes used to manage bird damage problems when lethal methods are determined to be appropriate. The birds are killed as quickly and humanely as possible. All firearm safety precautions are followed by WS when conducting BDM activities and all laws and regulations governing the lawful use of firearms are strictly complied with.

Firearm use is very sensitive and a public concern because of safety issues relating to the public and misuse. To ensure safe use and awareness, WS employees who use firearms to conduct official duties are required to attend an approved firearms safety and use training program within 3 months of their appointment and a refresher course every 3 years afterwards (WS Directive 2.615). WS employees, who carry firearms as a condition of employment, are required to sign a form certifying that they meet the criteria as stated in the *Lautenberg Amendment* which prohibits firearm possession by anyone who has been convicted of a misdemeanor crime of domestic violence.

Snap traps are modified rat snap traps used to remove individual woodpeckers, starlings, and other cavity use birds. The trap treadle is baited with peanut butter or other taste attractants and attached near the damage area caused by the woodpecker. These traps pose no imminent danger to pets or the public.

LETHAL METHODS - CHEMICAL

All chemicals used by WS are registered under FIFRA (administered by the EPA and TDA) or by the FDA. WS personnel that use chemical methods are certified as pesticide applicators by TDA and are required to adhere to all certification requirements set forth in FIFRA and Texas pesticide control laws and regulations. Chemicals are only used on private, public, or tribal property sites with authorization from the property owner/manager. Chemical methods are not currently used at LAFB. However there are a number of chemicals available for bird damage management. These include:

CO2 is sometimes used to euthanize birds which are captured in live traps and when relocation is not a feasible option. Live birds are placed in a container such as a plastic 5-gallon bucket or chamber and sealed shut. CO2 gas is released into the bucket or chamber and birds quickly die after inhaling the gas.

DRC-1339 is the principal chemical method that would be used for starling and pigeon damage management in the proposed action. For more than 30 years, DRC-1339 has proven to be an effective method of starling, blackbird, gull, and pigeon control at feedlots, dairies, airports, and in urban areas (West et al. 1967, Besser et al. 1967, Decino et al. 1966). Studies continue to document the effectiveness of DRC-1339 in resolving starling problems at feedlots (West and Besser 1976, Glahn 1982, Glahn and Otis 1981) and Blanton et al. (1992) reports that DRC-1339 appears to be a very effective, selective, and safe means of urban pigeon population reduction. Glahn and Wilson (1992) noted that baiting with DRC-1339 is a cost-effective method of reducing damage by blackbirds to sprouting rice.

DRC-1339 is a slow acting avicide that is registered with the EPA for reducing damage from several species of birds, including blackbirds, starlings, pigeons, crows, ravens, magpies, and gulls. DRC-1339 was developed as an avicide because of its differential toxicity to mammals. DRC-1339 is highly toxic to sensitive species but only slightly toxic to non-sensitive birds, predatory birds, and mammals. For example, starlings, a highly sensitive species, require a dose of only 0.3 mg/bird to cause death (Royall et al. 1967). Most bird species that are responsible for damage, including starlings, blackbirds, pigeons, crows, magpies, and ravens are highly sensitive to DRC-1339. Many other bird species such as raptors, sparrows, and eagles are classified as non-sensitive. Numerous studies show that DRC-1339 poses minimal risk of primary poisoning to non-target and T&E species (USDA 1997). Secondary poisoning has not been observed with DRC-1339 treated baits. During research studies, carcasses of birds which died from DRC-1339 were fed to raptors and scavenger mammals for 30 to 200 days with no symptoms of secondary poisoning observed (Cunningham et al. 1981). This can be attributed to relatively low toxicity to species that might scavenge on blackbirds and starlings killed by DRC-1339 and its tendency to be almost completely metabolized in the target birds which leaves little residue to be ingested by scavengers. Secondary hazards of DRC-1339 are almost non-existent. DRC-1339 acts in a humane manner producing a quiet and apparently painless death.

DRC-1339 is unstable in the environment and degrades rapidly when exposed to sunlight, heat, or ultra violet radiation. DRC-1339 is highly soluble in water but does not hydrolyze and degradation occurs rapidly in water. DRC-1339 tightly binds to soil and has low mobility. The half life is about 25 hours, which means it is nearly 100% broken down within a week, and identified metabolites *(i.e.*, degradation chemicals) have low toxicity. Aquatic and invertebrate toxicity is low (USDA 1997). USDA (1997, Appendix P) contains a thorough risk assessment of DRC-1339 and the reader is referred to that source for a more complete discussion. That assessment concluded that no adverse effects are expected from use of DRC-1339.

DRC 1339 has several EPA Registration Labels (56228-10, 56228-17, 56228-28, 56228-29, and 56228-30) depending on the application or species involved in the damage reduction project.